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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 36, MAY 25, 1998

01
AERONAUTICS (GENERAL)

19980037570 Logistics Management Inst., McLean, VA USA

Aviation Maintenance Contract Management : A Survey of Defense and Commercial Practices ***Final Report***

Erickson, Steven R., Logistics Management Inst., USA; Marafioti, Ronald J., Logistics Management Inst., USA; Summerour, Richard, Logistics Management Inst., USA; Nov. 1997; 82p; In English

Contract(s)/Grant(s): DASW01-95-C-0019

Report No.(s): AD-A334551; LMI-LG603T1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Logistics Management Institute was tasked to survey the commercial and Defense processes for contract maintenance management. The study focused on two primary areas. The first addresses expanded use of contract maintenance. We found aircraft contract maintenance has proven itself to be a reliable production source within DoD and capable of expanding to accommodate further outsourcing. However, DoD needs to issue guidance to support the increasing use of contracting contemplated in Defense acquisition policy. The second area of study addresses the use of commercial practices. Rescinded military specifications and standards are being replaced by a proliferation of alternative commercial practices. Contract management activities are working to adopt single commercial practices on a site-by-site basis but would benefit from DoD-wide designation of preferred commercial standards. DoD's use of commercial sources would benefit from improved cross-service coordination of market research efforts and sharing of lessons learned. Further changes to acquisition rules may be needed to accept external (third party) certifications and audits of commercial sources of repair.

DTIC

Aircraft Maintenance; Contract Management; Defense Program; Logistics Management; Standards; Specifications; Procedures

19980037700 Logistics Management Inst., McLean, VA USA

Predicting Wartime Demand for Aircraft Spares ***Final Report***

Slay, F. M., Logistics Management Inst., USA; Sherbrooke, Craig C., Logistics Management Inst., USA; Apr. 1997; 47p; In English

Contract(s)/Grant(s): DASW01-95-C-0019

Report No.(s): AD-A335362; LMI-AF501MR2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

U. S. fighter aircraft demanded surprisingly few spare parts in Desert Storm despite flying long hours. Although the sorties flown were much longer than their peacetime counterparts, demands per sortie remained about the same. This simple observation raised suspicions that parts fail on the basis of sorties flown, not hours flown, even though Air Force planning systems forecast demands on the basis of projected flying hours. This method of forecasting demands proved inadequate in 1993 when the war plans were modified to include the longer sorties that typify regional conflict scenarios. We found that demands are, for most aircraft, much more closely related to sorties flown than to flying hours. We developed a demand forecasting method that incorporates our results into the wartime spares requirements computation Called Decelerated Demand Forecasting, this method has been implemented by the Air Force for fighters and bombers, avoiding a $1.1 billion overstatement in the gross requirement.

DTIC

Bomber Aircraft; Spare Parts; Fighter Aircraft

19980037720 University of Southern California, Behavioral Technology Labs., Redondo Beach, CA USA

An Intelligent Tutor for Diagnosing Faults in an Aircraft Power Distribution System ***Final Report, 1 Jul. - 31 Dec. 1997***

Towne, Douglas M., University of Southern California, USA; Dec. 1997; 28p; In English

Contract(s)/Grant(s): N00014-97-I-0893

Report No.(s): AD-A334921; TR-118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A domain-general authoring system, DIAG, was employed to develop an intelligent tutor for diagnosing faults in a dual generator AC/DC power distribution system. The application provides an operable simulation of the front panel used to control power distribution in a dual engine aircraft, 148 replaceable units that comprise the functional elements of tile target system, and a number of test points for performing fault isolation tests. In all, 105 faults are simulated for presentation to the learner. Based entirely upon the model of tile power distribution system, DIAG was able to generate context-specific advisement concerning (1) the effectiveness of the diagnostic strategy employed by an individual learner, (2) the rationality of the learner's suspicions considering the symptoms seen, and (3) recommended next steps to further isolate tile simulated fault. The three most significant findings resulting from this development effort were that (1) no changes were required in tile DIAG authoring system or intelligent advisement functions to implement this new and complex domain, (2) the instructional intelligence, in the form of generated dialogues, was produced automatically and required no acquisition or representation of human expertise, and (3) the application was produced in a very short time, approximately 22 man days.

DTIC

Fault Detection; Computer Assisted Instruction; Aircraft Power Supplies; Systems Health Monitoring

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

19980037022 Cincinnati Univ., OH USA

Development of LES Methodology for the Analysis of High-Reynolds Number 2-D and 3-D Dynamic Stall Phenomenon ***Final Report, 1 Jun. 1993 - 31 May 1997***

Ghia, K., Cincinnati Univ., USA; Ghia, U., Cincinnati Univ., USA; Dec. 09, 1997; 87p; In English

Contract(s)/Grant(s): F49620-93-I-0393

Report No.(s): AD-A335686; AFL-97-12-86; AFRL-SR-BL-TR-98-0101; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The major objective of the AASERT Grant was to improve the analysis tools as well as assure the level of accuracy and efficiency that can be realized in the study of physics of the dynamic stall and related unsteady phenomena, through the development of the LES/DNS methodology. One M.S. and three Ph.D students were supported partially on this grant. The work carried out consisted of study of external unsteady flow using vorticity stream function formulation, analysis of boundary layer receptivity and transition using DNS methodology with spectral technique and, finally, compressibility effects in maneuvering body flows. Significant accomplishment is made in Object Oriented Numerics and high performance computing.

DTIC

Unsteady Flow; High Reynolds Number; Compressibility Effects; Boundary Layer Transition

19980037426 Virginia Polytechnic Inst. and State Univ., Engineering Science and Mechanics Dept.;, Blacksburg, VA USA

Wind Tunnel 'Free Flight' on a Dynamic Strut ***Final Report, 1 Sep. 1993 - 31 Aug. 1997***

Telionis, D. P., Virginia Polytechnic Inst. and State Univ., USA; Jan. 09, 1998; 54p; In English

Contract(s)/Grant(s): F49620-93-I-0455; AF Proj. 3484

Report No.(s): AD-A335700; AFRL-SR-BL-TR-98-0100; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Work on this project was distributed to various tasks. The first was design construction and calibration of a simple, one degree of freedom model. The second was the development of fuzzy logic software needed to control the motion. The third was appropriate balance systems and dynamic calibration techniques. A roll moment balance system was designed and constructed. The system was mounted to a stepper motor via a shaft which played the role of a roll actuator. The electronic components and software necessary to provide direct feedback were constructed and tested. A computer program was written and tested. As input to the program we employed the reading of pressure transducers connected with a seven hole probe. The desired output was the actual orientation of the probe as well as the static and dynamic pressure. The program was employed to generate static pressure, dynamic pressure and three components of the velocity in terms of the signals obtained by the pressure transducers. To further test this software it was decided to employ a dynamic mechanism which is available and operational. This involved the response of a ship hull to oncoming waves. The fuzzy logic system was trained with data obtained with different wave characteristics and ship incidence. The idea was to train the artificial intelligence system to predict the response of the vessel, namely pitch and roll characteristics

to new conditions. More specifically, the ship learns to recognize the condition of the sea it finds itself in. It then predicts how it will respond, if it points in a different direction.
DTIC
Shafts (Machine Elements); Pressure Sensors; Fuzzy Systems; Free Flight; Degrees of Freedom; Dynamic Pressure; Actuators

19980037670 NASA Langley Research Center, Hampton, VA USA
Hypersonic Boundary-Layer Transition for X-33 Phase 2 Vehicle
Thompson, Richard A., NASA Langley Research Center, USA; Hamilton, Harris H., II, NASA Langley Research Center, USA; Berry, Scott A., NASA Langley Research Center, USA; Horvath, Thomas J., NASA Langley Research Center, USA; Nowak, Robert J., NASA Langley Research Center, USA; 1998; 14p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): NASA/TM-1998-207316; NAS 1.15:207316; AIAA Paper 98-0867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A status review of the experimental and computational work performed to support the X-33 program in the area of hypersonic boundary-layer transition is presented. Global transition fronts are visualized using thermographic phosphor measurements. Results are used to derive transition correlations for ”smooth body” and discrete roughness data and a computational tool is developed to predict transition onset for X-33 using these results. The X-33 thermal protection system appears to be conservatively designed for transition effects based on these studies. Additional study is needed to address concerns related to surface waviness. A discussion of future test plans is included.
Author
Boundary Layer Transition; Hypersonics; Flow Distribution; Wind Tunnel Tests; Finite Volume Method; Flow Visualization

19980037673 Department of the Navy, Washington, DC USA
Duct Flow Control System
Rogers, Ernest O., Inventor, Department of the Navy, USA; Feb. 19, 1997; 11p; In English
Patent Info.: US-Patent-Appl-SN-802701
Report No.(s): AD-D018658; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A duct fixed to a vehicle propelled through an ambient fluid medium is internally provided with spaced channel passages from which the fluid medium is ejected under pressure tangentially of local duct surfaces through slots at the trailing edge of the duct. The supply of the pressurized fluid medium under selective control is limited to different angular segments of the channel passages in order to modify the flow stream through the duct so as to perform certain functions such as thrust control and steerage control effects enhancing vehicle maneuverability.
DTIC
Patent Applications; Shrouded Propellers; Marine Propulsion; Aerial Explosions

19980037838 NASA Ames Research Center, Moffett Field, CA USA
Boundary Layer Transition in the Leading Edge Region of a Swept Cylinder in High Speed Flow
Coleman, Colin P., NASA Ames Research Center, USA; Mar. 1998; 205p; In English
Contract(s)/Grant(s): RTOP 522-31-12
Report No.(s): NASA/TM-1998-112224; A-98-09981; NAS 1.15:112224; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Experiments were conducted on a 76 degree swept cylinder to establish the behavior of the attachment line transition process in a low-disturbance level, Mach number 1.6 flow. For a near adiabatic wall condition, the attachment-line boundary layer remained laminar up to the highest attainable Reynolds number. The attachment-line boundary layer transition under the influence of trip wires depended on wind tunnel disturbance level, and a transition onset condition for this flow is established. Internal heating raised the surface temperature of the attachment line to induce boundary layer instabilities. This was demonstrated experimentally for the first time and the frequencies of the most amplified disturbances were determined over a range of temperature settings. Results were in excellent agreement to those predicted by a linear stability code, and provide the first experimental verification of theory. Transition onset along the heated attachment line at an R-bar of 800 under quiet tunnel conditions was found to correlate with an N factor of 13.2. Increased tunnel disturbance levels caused the transition onset to occur at lower cylinder surface temperatures and was found to correlate with an approximate N factor of 1 1.9, so demonstrating that the attachment-line boundary layer is receptive to increases in the tunnel disturbance level.
Author
Boundary Layer Transition; Leading Edges; Wind Tunnel Tests; Reynolds Number; Swept Wings; Supersonic Flow

19980038062 NASA Ames Research Center, Moffett Field, CA USA

Turbulence Measurements on a Flap-Edge Model ***Final Report***

Moriarty, Patrick, Stanford Univ., USA; Bradshaw, Peter, Stanford Univ., USA; Cantwell, Brian, Stanford Univ., USA; Ross, James, NASA Ames Research Center, USA; Mar. 31, 1998; 40p; In English

Contract(s)/Grant(s): NCC2-5140

Report No.(s): NASA/CR-1998-207339; NAS 1.26:207339; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Turbulence measurements have been made on a flap-edge and leading-edge slat model using hot-wire anemometry, and, later, particle image velocimetry. The properties of hot-wire anemometry were studied using facilities at NASA Ames Research Center. Hot-film probes were used because of their durability, but cross-films were limited by non-linear end effects. As a warm-up exercise, hot-film probes were used to measure velocities in the farfield wake of a cylinder with an airfoil in the near-field wake. The airfoil reduced the drag coefficient of the system by 10%. A single-wire hot-film probe was used to measure velocity profiles over the top of a NACA 63(sub 2)-215 Mod. B wing with a Fowler flap and leading,-edge slat. Results showed the size of slat wake was dependent upon the slat deflection angle. Velocity increased through the slat gap with increased deflection. The acoustically modified slat decreased the chance of separation. Measurements were taken at the flap edge with a single hot-film. Trends in the data indicate velocity and turbulence levels increase at the flap edge. The acoustically modified flap modifies the mean flow near the flap edge. Correlations were made between the hot-film signal and the unsteady pressure transducers on the wing which were published in a NASA CDTM. The principles of Particle Image Velocimetry (PIV) were studied at Florida State University. Spectral PIV was used to measure the spectra of a subsonic jet. Measured frequencies were close to the predicted frequency of jet shedding. Spectral PIV will be used to measure the spectra of the slat flow in the second 7 x lO-ft. wind tunnel test. PIV has an advantage that it can measure velocity and spectra of the entire flowfield instantaneously. However, problems arise when trying, to store this massive amount of PIV data. Support for this research has continued through a NASA Graduate Student Program Fellowship which will end in June 1999. The thesis should be completed by this time.

Author

Flow Measurement; Turbulent Flow; Flapping; Models; Wind Tunnel Tests

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

19980038243 Illinois Univ., Dept. of Aeronautical and Astronautical Engineering, Urbana-Champaign, IL USA

The Effects of the Critical Ice Accretion on Airfoil and Wing Performance ***Final Report, 24 Jan. 1995 - 30 Nov. 1996***

Selig, Michael S., Illinois Univ., USA; Bragg, Michael B., Illinois Univ., USA; Saeed, Farooq, Illinois Univ., USA; Mar. 03, 1998; 25p; In English

Contract(s)/Grant(s): NCC3-408; NCC3-509

Report No.(s): NASA/CR-96-207501; NAS 1.26:207501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In support of the NASA Lewis Modern Airfoils Ice Accretion Test Program, the University of Illinois at Urbana-Champaign provided expertise in airfoil design and aerodynamic analysis to determine the aerodynamic effect of ice accretion on modern airfoil sections. The effort has concentrated on establishing a design/testing methodology for ”hybrid airfoils” or ”sub-scale airfoils,” that is, airfoils having a full-scale leading edge together with a specially designed and foreshortened aft section. The basic approach of using a full-scale leading edge with a foreshortened aft section was considered to a limited extent over 40 years ago. However, it was believed that the range of application of the method had not been fully exploited. Thus a systematic study was being undertaken to investigate and explore the range of application of the method so as to determine its overall potential.

Author

Aerodynamic Characteristics; Design Analysis; Airfoils; Leading Edges; Ice Formation

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 17 Space Communications, Spacecraft Communications, Command and Tracking and 32 Communications and Radar.

19980037702 Department of the Navy, Washington, DC USA
Waypoint Navigation Using Exclusion Zones
Jones, gregory B., Inventor, Department of the Navy, USA; Shaw, Christopher, Inventor, Department of the Navy, USA; Hills, J., Inventor, Department of the Navy, USA; Jul. 08, 1997; 8p; In English
Patent Info.: Filed 19 Jul. 1995; US-Patent-Appl-SN-504374; US-Patent-5,646,855
Report No.(s): AD-D018675; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method is provided for navigating a vehicle. Waypoint exclusion zones are defined as circles whose centers are known position waypoints. The vehicle is steered along a path that is tangential to the current waypoint exclusion zone. This path that is maintained until a relative bearing between the vehicle and a center of the current waypoint exclusion zone is at least 90 deg if the path is left of the center of the current waypoint exclusion zone. and at most 90 deg if the path is right of the center of the current waypoint exclusion zone. When either of these conditions is met, the vehicle is located along the circle of the current waypoint exclusion zone. The vehicle is then advanced along the circle of the current waypoint exclusion zone until a heading of the vehicle matches a heading of a path that: is tangential to the next waypoint exclusion zone. When the heading of the vehicle matches the heading of the path that is tangential to the next waypoint exclusion zone. the next waypoint exclusion zone becomes the current waypoint exclusion zone for carrying out the steering. maintaining and advancing of the vehicle.
DTIC
Autonomous Navigation; Navigation; Steering

19980037925 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Pseudorandom Code Generation for Communication and Navigation System Applications
Brendle, John F., Jr, Air Force Inst. of Tech., USA; Dec. 1997; 101p; In English
Report No.(s): AD-A336311; AFIT-GE-ENG-97D-16; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This research project investigated the design, construction and evaluation of a pseudorandom code generator for communication and navigation system applications. These types of codes include spreading codes, Gold codes, Jet Propulsion Laboratory (JPL) ranging codes, syncopated codes, and nonlinear codes. Such waveforms are typically used in communication and navigation system applications. The code generator uses the Stanford Telecom STEL-1032 Pseudorandom Number (PRN) coder. A coder interface was designed and constructed for manual data entry to the registers of the PRN coder. The code generator is capable of independently clocking and generating all possible codes with lengths up to 2(exp 32) - 1(4,294,967,295). The codes can be started with any random phase. The code generator is capable of detecting a specific position in the code and the coders can be truncated and restarted at that point. The three independent coder outputs are combinable, expanding the lengths and versatility o f the codes. The generation of a nonlinear code is possible using an internally programmable look-up table. Several test were conducted on the code generator to ensure its capability of generating Gold codes, JPL ranging codes, syncopated codes, and non-linear codes. The required documentation is being submitted for a U.S. patent.
DTIC
Coders; Communication; Navigation Aids; Detection; Computer Programs; Random Variables

19980037935 Naval Postgraduate School, Monterey, CA USA
Algorithms for LORAN-C Time Difference Error Minimization ***Interim Report, 1 Jan. - 30 Sep. 1997***
Cristi, Roberto, Naval Postgraduate School, USA; Tummala, Murali, Naval Postgraduate School, USA; France, Frederick M., Jr., Naval Postgraduate School, USA; Jan. 09, 1998; 25p; In English
Report No.(s): AD-A337871; NPS-EC-98-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA Coast Guard (USCG) is in the process of upgrading the hardware of the LORAN-C Radionavigation System Control System. As part of this effort, the Computer Assisted LORAN-C Controller (CALOC), is also in need of improvement. CALOC performs four tasks: abnormality detection, time difference control, recordkeeping, and blink control. The work reported in this report focuses on time difference control. In many instances, CALOC does not accurately control the time difference error (TDE) within the established USCG control procedures. Two new algorithms are proposed here to control TDE more effectively: a proportional integral derivative (PID) controller and a Kalman filter. Actual TDE data recorded at three different master stations covering five LORAN-C chains is used to evaluate the performance of the proposed controllers. The PID controller shows a sub-

stantial improvement in control compared to CALOC, and the Kalman filter exhibits even better performance, based on preliminary results. This improvement in control correlates directly with an increase in both predictable accuracy and repeatable accuracy.
DTIC
Signal Processing; LORAN C; Algorithms

19980038248 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Cepstral Processing For GPS Multipath Detection and Mitigation
Ormsby, Charles D., Air Force Inst. of Tech., USA; Dec. 1997; 115p; In English
Report No.(s): AD-A336668; AFIT/GE/ENG/97D-19; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This work presents a novel approach to code phase multipath mitigation for Global Positioning System (GPS) receivers. It uses the power and complex cepstra for multipath detection and mitigation prior to code phase tracking by a standard non-coherent delay lock loop. Cepstral theory is presented to demonstrate how multipath reflection delays can be detected through the use of the power cepstrum. Filtering can then be performed on the complex cepstrum to remove multipath effects in the cepstral domain. Finally, an inverse complex cepstrum is calculated yielding a theoretically multipath free direct path estimate in the time domain. Simulations are presented to verify the applicability of cepstral techniques to the problem of GPS multipath mitigation. Results show that, under noiseless conditions, cepstral processing prior to code tracking by a standard non-coherent delay lock loop leads to lower code tracking biases than direct tracking of the composite multipath signal by a narrow correlator receiver. Finally, this work shows that cepstral processing is highly sensitive to additive white Gaussian noise effects, leading to the conclusion that methods of limiting noise effects must be developed before this technique will be applicable in actual GPS receivers.
DTIC
Global Positioning System; Multipath Transmission; Cepstral Analysis

19980040968 General Accounting Office, Account and Information Management Div., Washington, DC USA
Air Traffic Control: Immature Software Acquisition Processes Increase FAA System Acquisition Risks
Mar. 21, 1997; In English
Report No.(s): PB98-119795; GAO/AIMD-97-47; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

Recognizing software's growing importance and prevalence in ATC systems, the Chairman, Subcommittee on Transportation and Related Agencies, House Committee on Appropriations, asked GAO to determine: (1) the maturity of FAA'S ATC modernization software acquisition processes, and (2) the steps/actions FAA has underway or planned to improve these processes, including any obstacles that may impede FAA's progress.
NTIS
Air Traffic Control; Congressional Reports; Risk; Transportation; Government Procurement; Computer Programs

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.

19980037578 Department of the Air Force, Washington, DC USA
Operational Requirements Document for the Unmanned Aerial Vehicle (UAV) Tactical Control System (TCS), 3.0
Jan. 1996; 10p; In English
Report No.(s): AD-A334778; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The requirement relates to the Office for the Under Secretary of Defense (Acquisition and Technology) Mission Areas 212 (Indirect Fire Support), 217 (Land Warfare Surveillance and Reconnaissance), 223 (Close Air Support and Interdiction), 227 (Air Warfare Surveillance and Reconnaissance), 232 (Amphibious, Strike, and Antisurface Warfare), 237 (Naval Warfare Surveillance and Reconnaissance), 322 (Tactical Intelligence and Related Activities (TIARA) for Tactical Land Warfare), 345 (Tactical Communications), 370 (Electronic Combat) and 373 (Tactical Surveillance, Reconnaissance, and Target Acquisition). The Tactical Control System (TCS) is the software, software- related hardware and the extra ground support hardware (antennae, cabling, etc.) necessary for the control of the Tactical Unmanned Aerial Vehicle (TUAV), and Medium Altitude Endurance (MAE) UAV, and future tactical UAVs. The TCS will also provide connectivity to identified Command, Control, Communications, Computers , and Intelligence (C4I) systems. TCS will have the objective capability of receiving High Altitude Endurance (MAE) UAV payload

information. Although developed as a total package, the TCS will have the capability to be configured and down- scaled to meet the user's deployability or operator limitations.
DTIC
Remotely Piloted Vehicles; Target Acquisition; Pilotless Aircraft; Command and Control

19980038063 Royal Melbourne Inst. of Tech., Sir Lawrence Wackett Centre for Aerospace Design Technology, Australia
The Enhancement of Canadian Forces, AETE and ARDU Flights for IFOSTP
Greenwell, P., Royal Melbourne Inst. of Tech., Australia; Nov. 1993; 124p; In English
Report No.(s): Rept-CR-93/02-Issue-1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In addition to the 600 hours of RAAF F/A-18 operational flight data enhanced for IFOSTP, a further 60 hours of Canadian forces flight data as well as two sets of flights trials data were processed. The Canadian forces flights were processed to demonstrate that the RAAF usage is also representative of the Canadian Forces fleet while the trials flights were carried out to investigate buffet at high angles of attack. The aim of the enhancement is to reconstruct the maintenance data to a higher frequency and better resolution than sampled by the on board recording system. This process is undertaken using a detailed flight dynamic model which, with the aid of a feedback controller, tracks on selected Right parameters to produce the enhanced data. Problems that arose during the processing of the flights were due either to faults within the supplied data or to limitations of the F/A-18 dynamic model. Procedures for handling these difficulties were developed and all the flights were successfully enhanced. The enhanced data has been stored and transferred electronically and a summary of the processed flight cases have been appended.
Derived from text
F-18 Aircraft; Buffeting; Angle of Attack; Frequencies

19980038071 NASA Langley Research Center, Hampton, VA USA
2020: Future Vision for Global Air Cargo
Logan, Michael J., NASA Langley Research Center, USA; 1998; 10p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-207322; NAS 1.15:207322; AIAA Paper 98-0437; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes a study conducted as a part of the National Aeronautics and Space Administration (NASA) Scenario-Based Strategic Planning process. During this process, Global Air Cargo was identified as one of several potential high-payoff vehicle classes for the year 2020. Within this vehicle class, a goal was established to provide a ten-fold reduction in the cost per ton-mile for air cargo shipments. In order to assess the issues associated with achieving this goal, a detailed systems analysis was conducted for this class of vehicle. The current air cargo industry was examined to determine potential design requirements including range (by virtue of airport-to-airport distance pairings), operating field length requirements (determined from a statistical analysis of current airport infrastructure), and specific design features (e.g. inter-modal container carriage, joint civil/military use). Several air cargo configuration concepts were developed and examined as a part of this study. These included several exclusively all-cargo concepts sized for six range payload combinations, and two passenger configurations modified for freighter use. Performance for each configuration was compared to the baseline (existing) aircraft. Technology sensitivity analysis was conducted using the lowest payload, shortest range and highest payload, longest range concepts. For each range-payload combination, the best concept was selected for economic analysis and compared to current fleet aircraft. The results indicate that a 75% reduction in the cost per ton-mile for cargo transportation (relative to DC-10-30F) is potentially achievable. In addition, a payload increase of 3x (over C-5B maximum) with a concurrent range improvement of 2.5x (relative to a C-5B) is also potentially achievable even within the current airport infrastructure limitations.
Author
Air Cargo; Management Planning; Payloads; Economic Analysis; Statistical Analysis

19980038176 Royal Melbourne Inst. of Tech., Sir Lawrence Wackett Centre for Aerospace Design Technology, Australia
Technology Foresight in Aerostructures
Wharington, J., Royal Melbourne Inst. of Tech., Australia; Mar. 1997; 100p; In English; Sponsored in part by Aerospace Technology Forum
Report No.(s): Rept-CR-97/03-Issue-1; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This report is the result of a data collection and assessment study by the Sir Lawrence Wackett Centre for Aerospace Design Technology at RMIT during spring and summer 1996. The study was requested by the Aerospace Technology Forum (ATF) as part of an ongoing forecasting program in aerostructures technology. This study is to assist ATF members in the appropriate management of Research and Development (R&D) by providing information on current perspectives in industry and academia and

advice on future strategies. This report is focused on findings from a literature review of the aerospace R&D enterprise and established foresight methodology.
Author
Data Acquisition; Forecasting; Surveys; Aerospace Technology Transfer

19980038229 Office of the Under Secretary of Defense (Acquisitions), Washington, DC USA
UAV Annual Report, FY 1997 ***Annual Report***
Jan. 1997; 48p; In English
Report No.(s): AD-A336710; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Military faces a challenging future in an era of dynamic change, constrained resources, potential new roles, and rapid technological advancement. These factors require innovative thinking and new ways to shape change. UAV's will he lp us shape this change. They represent both a revolution in military affairs and a revolution in business affairs. The capacity to dominate any adversary and control any situation in any operation will be the key capability we ask of our armed forces in the 21st century. UAV's will provide a sustained responsive, accurate picture of the battlefield.
DTIC
Armed Forces; Commerce; Aerial Reconnaissance; Remotely Piloted Vehicles; Reconnaissance Aircraft

19980038234 Army Research Lab., Aberdeen Proving Ground, MD USA
Investigation of the UH-60 Main Rotor Spindle Assembly Retaining Rods P/N 70102-08102/-103 ***Final Report, Apr. 1996 - Jan. 1998***
Grendahl, Scott M., Army Research Lab., USA; Jan. 1998; 118p; In English
Report No.(s): AD-A337105; ARL-TR-1585; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The U.S. Army Research Laboratory (ARL) was tasked by the U.S. Army Aviation and Troop Command (ATCOM) to perform a metallurgical examination of main rotor spindle assembly retaining rods fabricated from precipitation hardened (PH 13-8 Mo) stainless steel by three different manufacturers. These components were subjected to prior spectrum load fatigue testing in order to qualify an alternate source. One of the manufacture's components exhibited only half the fatigue resistance of the other two. The results of fatigue testing (of coupons sectioned from the original rods) showed a dramatic difference between the rods. Metallography was utilized to examine the microstructure and grain size. The structure of each rod was consistent with the prior treatment, and the grain size met the governing requirement. The amount of delta (free) ferrite within the structure varied slightly from rod to rod, but was well within the specified limits. The threads of each rod were examined metallographically, since this was the area of failure as a result of the spectrum load fatigue testing. Although differences in the surface profile of the threads from the different manufacturers were noted, there was no evidence of gross abnormalities such as tear out or chatter. The chemical analysis of each rod varied, but each composition met the governing requirements. Based upon the results of reheat treating, it was concluded that an inadequate prior heat treatment sequence was performed by the manufacturer.
DTIC
Fatigue Tests; Fracture Strength; Spindles; Rotors; Heat Treatment; Military Technology

19980039330 NASA Dryden Flight Research Center, Edwards, CA USA
Operational Concepts for Uninhabited Tactical Aircraft
Deets, Dwain A., NASA Dryden Flight Research Center, USA; Purifoy, Dana, NASA Dryden Flight Research Center, USA; Apr. 1998; 8p; In English; Symposium on System Design Considerations for Uninhabited Tactical Aircraft, 7-9 Oct. 1997, Athens, Greece
Contract(s)/Grant(s): RTOP 529-31-94
Report No.(s): NASA/TM-1998-206549; NAS 1.15:206549; H-2245; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes experiences with five remotely piloted flight research vehicle projects in the developmental flight test phase. These projects include the Pathfinder, Perseus B, Altus, and X-36 aircraft and the Highly Maneuverable Aircraft Technology (HiMAT). Each of these flight projects was flown at the NASA Dryden Flight Research Center. With the exception of the HiMAT, these projects are a part of the Flight Research Base Research and Technology (R&T) Program of the NASA Aeronautics and Space Transportation Technology Enterprise. Particularly with respect to operational interfaces between the ground-based pilot or operator, this paper draws from those experiences, then provides some rationale for extending the lessons learned during developmental flight research to the possible situations involved in the developmental flights proceeding deployed uninhabited tactical aircraft (UTA) operations. Two types of UTA control approaches are considered: autonomous and remotely piloted. In

each of these cases, some level of human operator or pilot control blending is recommended. Additionally, ”best practices” acquired over years of piloted aircraft experience are drawn from and presented as they apply to operational UTA.
Author
Remotely Piloted Vehicles; Research Vehicles; Product Development; Flight Tests

19980039331 NASA Dryden Flight Research Center, Edwards, CA USA
Recent Flight Test Experience with Uninhabited Aerial Vehicles at the NASA Dryden Flight Research Center
DelFrate, John H., NASA Dryden Flight Research Center, USA; Cosentino, Gary B., NASA Dryden Flight Research Center, USA; Apr. 1998; 12p; In English
Contract(s)/Grant(s): RTOP 529-10-04-M1
Report No.(s): NASA/TM-1998-206546; NAS 1.15:206546; H-2233; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Dryden Flight Research Center has had substantial involvement with uninhabited aerial vehicles (UAVs) in the past. These vehicles include the Highly Maneuverable Aircraft Technology (HiMAT) aircraft and a new breed of UAVs, such as the X-36 and the Pathfinder. This article describes lessons learned with the current UAVs which may help others in any stage of UAV design or flight testing. Topics discussed include airspace factors, weather factors, frequency availability, range safety, human factors and crew station design, hardware and software design redundancy, ground testing, simulator use, flight testing procedures, crew training, and environmental testing.
Author
Head-Up Displays; Remotely Piloted Vehicles; Cockpits; Procedures; Flight Tests

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also 05 Aircraft Design, Testing and Performance.

19980037624 Department of the Navy, Washington, DC USA
Fin Assembly for a Vehicle
Cho, Chahee P., Inventor, Department of the Navy, USA; Olson, Stanley J., Inventor, Department of the Navy, USA; Aug. 26, 1997; 7p; In English
Patent Info.: Filed 1 May 1996; US-Patent-Appl-SN-649834; US-Patent-5,661,260
Report No.(s): AD-D018689; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A fin assembly for effecting guidance of a vehicle through a fluid medium includes an electromagnet fixed in a portion of the vehicle, and a rigid shaft fixed to a hull portion of the vehicle and extending outwardly therefrom and in alignment with the electromagnet. A fin is rotatably mounted on the shaft and is, at least in part, a permanent magnet. A switch assembly is provided in the vehicle for effecting in a first portion of the electromagnet an attractive force between the electromagnet and the permanent magnet, and in a second portion of the electromagnet a repelling force there between, to cause the fin to rotate on the shaft in a selected direction to effect the guidance of the vehicle.
DTIC
Fins; Permanent Magnets; Hydrodynamics; Hulls (Structures); Electromagnets; Guidance (Motion)

19980039322 NASA Langley Research Center, Hampton, VA USA
Redesign of a Variable-Gain Output Feedback Longitudinal Controller Flown on the High-Alpha Research Vehicle (HARV)
Ostroff, Aaron J., NASA Langley Research Center, USA; Mar. 1998; 36p; In English
Contract(s)/Grant(s): RTOP 522-22-21-03
Report No.(s): NASA/TP-1998-206938; NAS 1.60:206938; L-17640; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a redesigned longitudinal controller that flew on the High-Alpha Research Vehicle (HARV) during calendar years (CY) 1995 and 1996. Linear models are developed for both the modified controller and a baseline controller that was flown in CY 1994. The modified controller was developed with three gain sets for flight evaluation, and several linear analysis results are shown comparing the gain sets. A Neal-Smith flying qualities analysis shows that performance for the low- and medium-gain sets is near the level 1 boundary, depending upon the bandwidth assumed, whereas the high-gain set indicates a sen-

sitivity problem. A newly developed high-alpha Bode envelope criterion indicates that the control system gains may be slightly high, even for the low-gain set. A large motion-base simulator in the UK was used to evaluate the various controllers. Desired performance, which appeared to be satisfactory for flight, was generally met with both the low- and medium-gain sets. Both the high-gain set and the baseline controller were very sensitive, and it was easy to generate pilot-induced oscillation (PIO) in some of the target-tracking maneuvers. Flight target-tracking results varied from level 1 to level 3 and from no sensitivity to PIO. These results were related to pilot technique and whether actuator rate saturation was encountered.
Author
Research Vehicles; Longitudinal Control; Feedback Control; Flight Characteristics

19980040072 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Multiple Model Adaptive Estimation and Control Redistribution Performance on the VISTA F-16 During Partial Actuator Impairments, Volume 2
Clark, Curtis S., Air Force Inst. of Tech., USA; Dec. 1997; 233p; In English
Report No.(s): AD-A336726; AFIT/GE/ENG/97D-23-Vol-2; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Multiple Model Adaptive Estimation with Control Reconfiguration (MMAE/CR) capability to estimate and compensate for partial actuator failures, or ”impairments” is investigated using the high-fidelity, nonlinear, six-degree-of-freedom, VISTA F-16 simulation which currently resides on the Simulation Rapid-Prototyping Facility (SRF). After developing a model for inserting partial actuator impairments into the VISTA F-16 truth model, research begins with a battery of single actuator impairment tests. This stage of research explores the capability of the existing MMAE algorithm to estimate single, partial actuator impairments, and helps to define refinements and expansions needed in the MMAE algorithm for the second phase of research: the detection and estimation of dual, total and partial actuator impairments. I t is seen from the first stage of research that, while MMAE is able to estimate partial impairments, there are refinements needed, such as ”probability smoothing and quantization”, to compensate for the quality of MMAE probability data and to provide a better, more stable estimate value to the Control Reconfiguration module. The Kalman filters and the dual, partial failure filter banks necessary for the detection of dual, partial actuator impairments are also defined as a result of the single impairment tests. Fifteen more banks of ”partial first-failure” Kalman filters are added to the existing MMAE algorithm, as well as the ”bank swapping” logic necessary to transition to them. Once the revised and expanded MMAE/CR algorithm is ready, research begins on dual combinations of total and partial actuator impairments. While results of these tests (for other than total impairments) are not as good as originally hoped or expected, the potential
DTIC
Failure; Algorithms; Flight Control; Control Systems Design; Jet Aircraft; Fighter Aircraft

12
ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

19980038068 USA Space Foundation, Colorado Springs, CO USA
The Promise of Space
Eisenhart, Steve, Editor, USA Space Foundation, USA; 1997; 232p; In English; 1997 National Space Symposium, 1-4 Apr. 1997, Colorado Sparings, CO, USA; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Specific programs and objectives support the Foundation’s four goals, which are: to promote the romance and relevance of space to the public with information, entertainment and products. to prepare K-12 educators in using space science and technology in the classroom to inspire students and enhance learning. to provide access to information on space policy, programs and current issues for space and business professionals. to develop and operate a Space Discovery Center theme attraction in Colorado Springs to support, distribute and deliver the Foundation’s programs, products and services. For the Foundation to achieve greatest success in these strategic directions, partnerships, alliances and support from government and industry are essential. Together we will be contributing to a continued strong America and to a future for our heirs that is at least as promising as the one we inherited.
Derived from text
Aerospace Industry; Research and Development; Technologies; Education; Space Programs; Space Law

19980038228 Naval Postgraduate School, Monterey, CA USA
Argentine Space Assets
Oyarzabal, Xavier P., Naval Postgraduate School, USA; Sep. 1997; 275p; In English
Report No.(s): AD-A337089; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This thesis is an attempt to define how some of the commercial space assets already in use or under development could be useful to the Argentine Navy as tools for better accomplishment of their basic missions. Research efforts involved investigating part of what is available on the international market and some space related international laws and policies that may represent limits for military use of civilian assets. Basically divided in two main areas, communications and remote sensing, this thesis covers the basics of GEO and LEO communication satellites and provides an overview of what could be expected from commercial remote sensing systems. Through examples, the feasibility of using civilian space assets in the military is demonstrated. Finally, an objective analysis is made to define the best approach to improve Argentine Navy space capabilities.
DTIC
Military Operations; Earth Orbits; Communication Satellites; Marketing

13
ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

19980040076 Connecticut Univ., Storrs, CT USA
Multisensor/Multiscan Detection Fusion ***Final Report, 1 Mar. 1995 - 28 Feb. 1997***
Bar-Shalom, Y., Connecticut Univ., USA; Pattipati, K. R., Connecticut Univ., USA; Apr. 15, 1997; 15p; In English
Contract(s)/Grant(s): F49620-95-I-0229
Report No.(s): AD-A336763; AFRL-SR-BL-TR-98-0088; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An algorithm has been developed to initiate tracks of a ballistic missile in initial exoatmospheric phase, using line of sight measurements from one or more moving platforms.
DTIC
Multisensor Fusion; Ballistic Missiles; Algorithms

15
LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also 20 Spacecraft Propulsion and Power.

19980037602 Department of the Navy, Washington, DC USA
Projectile Launcher
Moody, Paul E., Inventor, Department of the Navy, USA; Sep. 30, 1997; 9p; In English; Supersedes US-Patent-Appl-SN-655103, AD-D018170.
Patent Info.: Filed 29 May 1996; US-Patent-Appl-SN-655103; US-Patent-5,671,722
Report No.(s): AD-D018690; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A projectile launching apparatus has a barrel for supporting a projectile prior to and during launch. The barrel is defined by a breech end, a muzzle end and a longitudinal launch axis along which the projectile is launched. A length of elastomeric material is fixed at its ends to opposing sides of the barrel aft of the muzzle end. Linear actuators are aligned parallel to and on opposite sides of the barrel. A guide or pulley is mounted on each of the linear actuators for linear movement therewith to positions forward of the ends of the elastomeric material. Third and fourth guides or pulleys are fixed by a frame such that the fourth pulley is positioned aft of the third pulley along the longitudinal launch axis. The elastomeric material is led along a path from one fixed end about the first pulley. between the third and fourth pulleys and about the second pulley to where the elastomeric material terminates at its other fixed end. When the frame is drawn toward the breech end of the apparatus, the third pulley and the fourth pulley are simultaneously drawn towards the breech end to stretch the elastomeric material. The stretched elastomeric material creates the potential for accelerating the projectile towards the muzzle end for a projectile placed forward of the third pulley.
DTIC
Projectiles; Launchers; Launching; Actuators

19980037621 Department of the Navy, Washington, DC USA

Spotting Round Bore Alignment Mechanism for Rocket Launcher

Canaday, Michael M., Inventor, Department of the Navy, USA; George, King, Inventor, Department of the Navy, USA; Aug. 19, 1997; 6p; In English; Superseded US-Patent-Appl-SN-514573, AD-D017916.

Patent Info.: Filed 14 Aug. 1995; US-Patent-Appl-SN-514573; US-Patent-5,657,546

Report No.(s): AD-D018742; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A mechanism for providing fine adjustment to achieve parallelism of a spotting rifle barrel and a launcher tube is provided. The mechanism uses a convex spherical or near spherical surface on the rear of the spotter barrel which is mated to a concave conical surface on the spotting rifle receiver. The receiver is rigidly affixed to the launcher tube. The spotting rifle barrel axis is adjusted by means of three adjustment screws which act on a locating washer attached to the muzzle of the rifle. The locating washer has a spherical or near spherical surface whose radius center is co-located with the radius center of a second spherical surface supporting the breech end of the barrel. These spherical surfaces permit the free pivoting of the barrel about the common radius centers. A barrel gripping collar is moved Into contact with the locating washer by means of a spring which forces the convex conical surface of the locating washer to engage the concave conical surface of the grip collar. This engagement creates a wedging action which causes the grip collar, which is split, to tighten onto the muzzle of the spotting barrel. The action of a spring causes the grip collar to be forced into the locating washer and also forces the barrel into the receiver. This spring also allows for barrel expansion, caused by heat during firing, without affecting the alignment of the axis.

DTIC

Patent Applications; Rifles; Gun Launchers; Launch Vehicles

19980037622 Department of the Navy, Washington, DC USA

Combination Optical and Iron Sight System for Rocket Launcher

Thibodeau, Robert, Inventor, Department of the Navy, USA; Canaday, Michael, Inventor, Department of the Navy, USA; Aug. 26, 1997; 7p; In English; Supersedes US-Patent-Appl-SN-514885, AD-D017928.

Patent Info.: Filed 14 Aug. 1995; US-Patent-Appl-SN-514885; US-Patent-5,659,965

Report No.(s): AD-D018741; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A combination optical and iron sight system for a rocket launcher is provided. The combination sight system has a mounting bracket for attachment to a spotter rifle of a typical rocket launcher. A sight mounting bracket having an elevation adjustment and a windage adjustment is adapted for attachment to the spotter rifle mounting bracket. The adjustable sight mounting bracket has a mounting structure for an iron sight and a mounting bracket structure for an optical sight. Each sight, the optical sight and iron sights may be adjusted individually with respect to the adjustable bracket. Thereafter, adjustments to both sights can be made simultaneously by adjustment of the bracket itself in both windage and elevation.

DTIC

Rocket Launchers; Visual Perception; Gun Propellants; Light Emission

19980037931 RAND Corp., Santa Monica, CA USA

Life Cycle Cost Assessments for Military Transatmospheric Vehicles

Eisman, Mel, RAND Corp., USA; Gonzales, Daniel, RAND Corp., USA; Jan. 1997; 62p; In English

Contract(s)/Grant(s): F49642-96-C-0001

Report No.(s): AD-A335252; RAND/MR-843-AF; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The X-33 and X-34 technology demonstration programs currently under way by NASA may ultimately lead to a commercial reusable launch vehicle (RLV). The first flight test for the X-33 vehicle is planned for early 1999. With NASA fully committed to the development of this first-ever completely reusable vehicle, it is prudent for the Air Force to examine the potential benefits, requirements, and costs for a military TransAtmospheric Vehicle (TAV). This vehicle would take advantage of technologies developed during RLV-related programs. Although similar in concept, a military TAV may differ significantly in design and in capability from an RLV produced to satisfy commercial market needs.

DTIC

Life Cycle Costs; Transatmospheric Vehicles; Space Commercialization; Launch Vehicles

16
SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. for related information see also 03 Air Transportation and Safety and 18 Spacecraft Design, Testing and Performance. For space suits see 54 Man/System Technology and Life Support

19980039345 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Space Shuttle East Coast Abort Modes for High Inclination Launches
Neufang, Richard K., Air Force Inst. of Tech., USA; Dec. 1997; 89p; In English
Report No.(s): AD-A335428; AFIT/GA/ENY/97D-3; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This study investigated the possibility of abort landing the Space Shuttle at east coast airports when launched at inclinations of 51.6 degrees or more. Computer modeling was used to characterize both the Shuttle launch out of Cape Canaveral and two methods of unpowered abort descents from various points in the launch following Solid Rocket Booster (SRB) separation. The first method used varying values of pitch and roll held constant to control the descent. By plotting the latitude and longitude of the point in the descent when the nominal landing altitude was achieved against locations of east coast airports it was found that there are indeed east coast abort opportunities for high inclination launches out of Cape Canaveral. The second method used a constant pitch and roll until the proper heading angle to intercept a desired target airport was reached then maneuver to 0 degrees roll and 30 degrees pitch. These trajectories were attempted throughout the launch for different airports so that windows of opportunity could be established. It was shown that these windows exist but only for limited times ranging from 8 to 34 seconds. These opportunities may be expanded if further studies investigate powered and optimal control cases.
DTIC
Space Shuttles; Trajectories; Computerized Simulation; Spacecraft Launching; Space Shuttle Boosters; Roll; Optimal Control; Descent

19980040954 Perugia Univ., Dipt di Chimica, Perugia, Italy
Dynamical Studies of Chemical Reactions Relevant to the Local Atmosphere of the Orbiting Space Shuttle ***Final Report, 1 Jul. 1996 - 30 Jun. 1997***
Casavecchia, Piergiorgio, Perugia Univ., Italy; Feb. 1998; 45p; In English
Contract(s)/Grant(s): F61708-94-C-0013
Report No.(s): AD-A337947; SPC-94-4042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking ”Dipartimento di Chimica, University of Perugia” as follows: The contractor will measure differential cross sections for reactions of O(3P), 0(1D) and OH(2P) with various radial and molecules present in the local atmosphere of the space shuttle in low earth orbit as described in the original proposal for this work.
DTIC
Quantum Chemistry; Space Shuttles; Dynamic Characteristics

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation.

19980037662 Naval Postgraduate School, Monterey, CA USA
System Identification of an Ultra-Quiet Vibration Isolation Platform
Beavers, George D., Naval Postgraduate School, USA; Jun. 1997; 170p; In English
Report No.(s): AD-A335286; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This thesis details the system identification and initial system validation of the an Ultra-Quiet Vibration Isolation Platform (UQP). With the move toward lighter and more flexible spacecraft, the effects of vibration are of immense concern. As natural or passive damping becomes less effective in controlling undesired vibrations, active vibration control becomes essential. The UQP uses a special configuration of the six degree of freedom Stewart Platform with piezoceramic strut actuators and geophone sensors. This combination gives an extremely sensitive and responsive six degree-of-freedom active vibration control system. Each actuator was designed to be controlled independently without coupling with other actuators. In order to develop control laws, the plant must be identified in terms of system zeros and poles and the uncoupled design validated. Dynamic modeling using para-

metric estimation methods can accurately describe a complex system. Using parameter estimation methods, models of the actuator system dynamics were obtained. A simple lead-lag controller was applied to individual actuators then all six actuators acting simultaneously to verify system coupling. Significant interaction between base adjoining actuators was discovered.
DTIC
Vibration Isolators; Mathematical Models; Identifying; Active Control

19980037671 Department of the Navy, Washington, DC USA
Non-Explosive Target Directed Reentry Projectile
Morrison, Alfred M., Inventor, Department of the Navy, USA; Vamos, John S., Inventor, Department of the Navy, USA; Dorsey, William G., Inventor, Department of the Navy, USA; Lyons, W. Carson, Inventor, Department of the Navy, USA; Jul. 22, 1997; 5p; In English
Patent Info.: Filed 19 May 1995; US-Patent-Appl-SN-446221; US-Patent-5,649,488
Report No.(s): AD-D018679; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The non-explosive core of a reentry projectile is fixedly positioned within a hollow casing of the projectile at a location maximizing conversion and transfer of kinetic energy to an earth bound target in response to the projectile's impact at a hypersonic velocity and at a steep impact angle to the surface of the earth. The hollow casing is formed of a material capable of withstanding high temperatures, therefore, not requiring any cooling and allowing for the hollow casing to be free of heat transfer medium that might otherwise impede the desired quick release of the core upon impact of the projectile. The core is in the form of a single dense metallic slug having a mass establishing a center of gravity and moments of inertia for the projectile as a kinetic energy warhead corresponding to that of an explosive or nuclear warhead without weapon system modification.
DTIC
Targets; Hypervelocity Projectiles; Reentry Effects; Kinetic Energy; Hypersonic Speed

19980037727 Department of the Navy, Washington, DC USA
Prime Avoidance Maneuvers
Mason, William J., Inventor, Department of the Navy, USA; Sep. 09, 1997; 13p; In English
Patent Info.: Filed 31 Jul. 1989; US-Patent-Appl-SN-387741; US-Patent-5,664,742
Report No.(s): AD-D018696; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A maneuver for minimizing perturbations on a released re-entry body due to gases exhausted from the nozzles of the post-boost control system in which after release of the re-entry body from a position compatible accomplishing with the maneuver, a flip turn is initiated in a near-nozzle-off configuration. The turn is preferably executed in a direction to the side of the direction of the velocity gain required for the platform to reach the next release location. The flip turn is stopped at a lateral escape angle, preferably after turning through an angle of 90 degrees or greater, by initiating an oppositely directed body-axis turn. After being accelerated for a lateral escape time, the platform is oriented in the direction of the required gain in velocity to reach the next release location and coarse thrust is activated. Prior to arrival at the release location, a body-axis turn is accomplished to orient the platform in the proper position for the next release event.
DTIC
Booster Rocket Engines; Reentry Vehicles; Position (Location); Perturbation; Guidance (Motion)

19980038137 National Space Development Agency, Tokyo, Japan
KISS & HOP Reusable Booster Near-Term Draft Proposal
Aoki, Hiroshi, National Space Development Agency, Japan; Oct. 1996; 40p; In English
Report No.(s): NASDA-TMR-950007T; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Now that H-2 rocket operations are smoothly underway, the time has come to give some consideration to the next phase in the development of Japan's space transportation systems. to put it more succinctly, it is time to seriously study our remaining options. As high transportation costs are a serious limiting factor affecting all space activities, the degree to which these costs can be reduced becomes our largest problem. Reports have indicated that we can expect renewed demand for space transportation if we can hold transportation costs down to one-fifth of their current level. Although it will not be possible to achieve this figure overnight, we should begin our attempt to reach this goal by deciding on a direction or scenario for future development. In light of the aforementioned need for lower transportation costs, this report investigates one proposal for development of a reusable transportation system.
Author
Space Transportation System; Reusable Launch Vehicles

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.

19980037588 Office of Naval Research, Arlington, VA USA
Anti Tip-Off Device
Sep. 30, 1997; 20p; In English
Report No.(s): AD-A334927; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An anti tip-off device for rocket rockets adapted for collapsible tube-in-tube launchers is provided. The dual-diameter launch tube requires stabilization of the rocket within the larger diameter tube. The anti tip-off device has two segments which together form a hollow cylinder which fits over the nose section of a standard high explosive anti-armor rocket. A sliding surface is located around the circumference of the cylinder to provide support for the rocket during transit of the larger launch tube. The surface contact prevents the rocket from wobbling or tipping during the rocket's transit of the launch tube. Alternately, permanently-bonded stabilizer legs or a bonded ring may be attached to the rocket to match the diameter of the larger launch tube. The anti tip-off device may be fabricated using any material suited to the launcher and rocket combination, including lexan, teflon, nylon, wood, or aluminum.
DTIC
Rocket Launchers; Expandable Structures; Launching; Fabrication; Stabilization; Aluminum

19980037958 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Optimal Orbit Insertion Strategies Using Combined High and Low Thrust Propulsion Systems
Johnson, Darren W., Air Force Inst. of Tech., USA; Dec. 1997; 101p; In English
Report No.(s): AD-A336420; AFIT/GSO/ENY/97D-02; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Low thrust electric propulsion systems are becoming sufficiently mature to consider their use as primary propulsion for orbital transfer in place of high thrust chemical systems. Instead of facing an either/or situation, it may be advantageous to use both types. This effort demonstrates a technique fo r finding orbital transfer strategies that use both high and low thrust propulsion systems and which result in optimal tradeoffs of the performance parameters cost of orbit insertion, total orbit transfer time, and available spacecraft mass at final orbit. These performance parameters are calculated as a function of the fraction of orbit transfer from Low Earth Orbit (LEO) to Geosynchronous Earth Orbit (GEO) provided by electric propulsion. Utility analysis is used to analyze each performance parameter and compute a total utility score for each orbit insertion strategy examined. Results from a variety of example space mission profiles yielded optimal orbit insertion strategies requiring both chemical and electric propulsion to provide a fraction of the LEO to GEO orbit transfer.
DTIC
Propulsion System Performance; Electric Propulsion; Earth Orbits; Thrust Control

23
CHEMISTRY AND MATERIALS (GENERAL)

19980039325 NASA Marshall Space Flight Center, Huntsville, AL USA
Database for the Tribological Properties of Self-Lubricating Materials
Jett, T. R., NASA Marshall Space Flight Center, USA; Thom, R. L., NASA Marshall Space Flight Center, USA; Feb. 1998; 20p; In English
Report No.(s): NASA/TM-1998-207195; NAS 1.15:207195; M-857; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A test program to determine the tribological properties of several self-lubricating composites was performed. Testing was done using an LFW-1 Friction and Wear machine. Each material was tested at four load levels (66 N, 133 N, 266 N, and 400 N) under ambient conditions. The coefficient of friction and wear rate was determined for each material, and a relative ranking of the composites was made.
Author
Wear; Coefficient of Friction; Self Lubricating Materials; Load Tests

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

19980037610 NASA Langley Research Center, Hampton, VA USA
Thin Layer Composite Unimorph Ferroelectric Driver and Sensor
Hellbaum, Richard F., Inventor, NASA Langley Research Center, USA; Bryant, Robert G., Inventor, NASA Langley Research Center, USA; Fox, Robert L., Inventor, NASA Langley Research Center, USA; May 27, 1997; 14p; In English
Patent Info.: Filed 4 Apr. 1995; NASA-Case-LAR-15348-1; US-Patent-5,632,841; US-Patent-Appl-SN-416598; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A method for forming ferroelectric wafers is provided. A prestress layer is placed on the desired mold. A ferroelectric wafer is placed on top of the prestress layer. The layers are heated and then cooled causing the ferroelectric wafer to become prestressed. The prestress layer may include reinforcing material and the ferroelectric wafer may include electrodes or electrode layers may be placed on either side of the ferroelectric layer. Wafers produced using this method have greatly improved output motion.
Official Gazette of the U.S. Patent and Trademark Office
Wafers; Ferroelectricity; Actuators; Prestressing

19980038055 NASA Langley Research Center, Hampton, VA USA
Method for Making a Carbon-Carbon Cylinder Block
Ransone, Phillip O., Inventor, NASA Langley Research Center, USA; Nov. 18, 1997; 17p; In English; Division of US-Patent-Appl-SN-416599, filed 4 Apr. 1995
Patent Info.: Filed 23 May 1996; NASA-Case-LAR-15094-2; US-Patent-5,687,634; US-Patent-Appl-SN-652736; US-Patent-Appl-SN-416599; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A method for making a lightweight cylinder block composed of carbon-carbon is disclosed. The use of carbon-carbon over conventional materials. such as cast iron or aluminum, reduces the weight of the cylinder block and improves thermal efficiency of the internal combustion reciprocating engine. Due to the negligible coefficient of thermal expansion and unique strength at elevated temperatures of carbon-carbon, the piston-to-cylinder wall clearance can be small, especially when the carbon-carbon cylinder block is used in conjunction with a carbon-carbon piston. Use of the carbon-carbon cylinder block has the effect of reducing the weight of other reciprocating engine components allowing the piston to run at higher speeds and improving specific engine performance.
Official Gazette of the U.S. Patent and Trademark Office
Carbon Compounds; Technologies; Cylindrical Bodies; Thermodynamic Efficiency; Weight Reduction

19980038369 Naval Air Systems Command, Point Mugu, CA USA
Naval Air Systems Team Advanced Materials Requirements, Programs, and Initiatives
Moore, Dale L., Naval Air Systems Command, USA; May 07, 1997; 148p; In English; International SAMPE Symposium and Exhibition, 4-8 May 1997, Anaheim, CA, USA
Report No.(s): AD-A338004; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Naval aviation is facing some of it's most complex and difficult challenges in recent history. The Navy's harsh, corrosive environment combined with the demands of carrier and sea based operations have always been formidable factors. Today, the continuing evolution of performance-based requirements in addition to emerging environmental and safety requirements are adding significantly to the Navy's challenge. Affordability is now an overarching consideration across the broad spectrum of naval aviation science and technology, acquisition development, production and in-service engineering activities. These synergistic requirements are driving the programs and initiatives of the Naval Aviation Materials Competency. This paper describes the complex scenario facing the naval aviation community, and the Materials Competency plans, programs and initiatives to meet the requirements of today as well as those anticipated for tomorrow.
DTIC
Technologies; Research and Development; Composite Materials; Corrosion Prevention

19980039323 Cleveland State Univ., Cleveland, OH USA
Isothermal Fatigue, Damage Accumulation, and Life Prediction of a Woven PMC ***Final Report***
Gyekenyesi, Andrew L., Cleveland State Univ., USA; Mar. 1998; 162p; In English
Contract(s)/Grant(s): NAG3-1543; RTOP 523-22-13-00

Report No.(s): NASA/CR-1998-206593; NAS 1.26:206593; E-10971; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This dissertation focuses on the characterization of the fully reversed fatigue behavior exhibited by a carbon fiber/polyimide resin, woven laminate at room and elevated temperatures. Nondestructive video edge view microscopy and destructive sectioning techniques were used to study the microscopic damage mechanisms that evolved. The residual elastic stiffness was monitored and recorded throughout the fatigue life of the coupon. In addition, residual compressive strength tests were conducted on fatigue coupons with various degrees of damage as quantified by stiffness reduction. Experimental results indicated that the monotonic tensile properties were only minimally influenced by temperature, while the monotonic compressive and fully reversed fatigue properties displayed noticeable reductions due to the elevated temperature. The stiffness degradation, as a function of cycles, consisted of three stages; a short-lived high degradation period, a constant degradation rate segment composing the majority of the life, and a final stage demonstrating an increasing rate of degradation up to failure. Concerning the residual compressive strength tests at room and elevated temperatures, the elevated temperature coupons appeared much more sensitive to damage. At elevated temperatures, coupons experienced a much larger loss in compressive strength when compared to room temperature coupons with equivalent damage. The fatigue damage accumulation law proposed for the model incorporates a scalar representation for damage, but admits a multiaxial, anisotropic evolutionary law. The model predicts the current damage (as quantified by residual stiffness) and remnant life of a composite that has undergone a known load at temperature. The damage/life model is dependent on the applied multiaxial stress state as well as temperature. Comparisons between the model and data showed good predictive capabilities concerning stiffness degradation and cycles to failure.

Author

Polymer Matrix Composites; Residual Strength; Compression Tests; Compressive Strength; Fatigue (Materials)

19980041206 Hi-Tech Ceramics, Alfred, NY USA

The Production of Distorted 3-3 Hydrophone Composites from Reticulated Ceramics ***Final Report***

Karst, Douglas, Hi-Tech Ceramics, USA; Norris, Andy, Hi-Tech Ceramics, USA; Sweeting, Truett, Hi-Tech Ceramics, USA; Dec. 30, 1997; 93p; In English

Contract(s)/Grant(s): N00014-94-C-0046

Report No.(s): AD-A334865; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Reticulated ceramics have been in production for over 20 years, primarily for molten metal filter applications. Annually, hundreds of thousands of square feet are produced with prices ranging down to twenty cents per cubic inch for some materials. This work was undertaken to apply reticulated ceramic processing techniques to piezoelectric ceramic-composite production and the subsequent production, testing, and evaluation of six hydrophone arrays. This first generation composite material is a rugged, distorted 3-3 piezoelectric ceramic composite with appreciable acoustical properties. Modeling results suggest that simple modifications will bring about enhanced sensitivities and acoustics. Sensitivity limits are imposed by the need to maintain strength at high pressures. Processing details are given in the Manufacturing Report, also delivered as part of this contract. Suggestions for an improved second generation material are presented. Composite costs are projected to be under $10/square inch in moderate volumes.

DTIC

Composite Materials; Technology Transfer; Piezoelectric Ceramics; Evaluation; Performance Tests

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INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

19980037545 NASA Ames Research Center, Moffett Field, CA USA

Characterization of the Minimum Energy Paths for the Ring Closure Reactions of C4H3 with Acetylene

Walch, Stephen P., NASA Ames Research Center, USA; Journal of Chemical Physics; Nov. 15, 1995; ISSN 0021-9606; Volume 103, No. 19, pp. 8544-8547; In English

Contract(s)/Grant(s): NCC2-478; NAS2-14031

Report No.(s): NASA/CR-95-207259; NAS 1.26:207259; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

The ring closure reaction of C4H3 with acetylene to give phenyl radical is one proposed mechanism for the formation of the first aromatic ring in hydrocarbon combustion. There are two low-lying isomers of C4H3; 1-dehydro-buta-l-ene-3-yne (n-C4H3)

and 2-dehydro-buta-l-ene-3-yne (iso-C4H3). It has been proposed that only n-C4H3 reacts with acetylene to give phenyl radical, and since iso-C4H3 is more stable than n-C4H3, formation of phenyl radical by this mechanism is unlikely. We report restricted Hartree-Fock (RHF) plus singles and doubles configuration interaction calculations with a Davidson's correction (RHF+1+2+Q) using the Dunning correlation consistent polarized valence double zeta basis set (cc-pVDZ) for stationary point structures along the reaction pathway for the reactions of n-C4H3 and iso-C4H3 with acetylene. n-C4H3 plus acetylene (9.4) has a small entrance channel barrier (17.7) (all energetics in parentheses are in kcal/mol with respect to iso-C4H3 plus acetylene) and the subsequent closure steps leading to phenyl radical (-91.9) are downhill with respect to the entrance channel barrier. Iso-C4H3 Plus acetylene also has an entrance channel barrier (14.9) and there is a downhill pathway to 1-dehydro-fulvene (-55.0). 1-dehydro-fulvene can rearrange to 6-dehydro-fulvene (-60.3) by a 1,3-hydrogen shift over a barrier (4.0), which is still below the entrance channel barrier, from which rearrangement to phenyl radical can occur by a downhill pathway. Thus, both n-C4H3 and iso-C4H3 can react with acetylene to give phenyl radical with small barriers.
Author
Hydrocarbon Combustion; Chemical Reactions; Chemical Energy; Acetylene

19980037591 Science and Technology International Corp., Honolulu, HI USA
A Hyperspectral Gas Analysis System (HyGAS) ***Final Report, Sep. 1992 - Nov. 1997***
Owensby, Pam, Science and Technology International Corp., USA; Sunshine, Jessica, Science and Technology International Corp., USA; Lo, Juliana, Science and Technology International Corp., USA; Zisk, Stan, Science and Technology International Corp., USA; Dec. 1997; 104p; In English
Contract(s)/Grant(s): DACA76-92-C-0037
Report No.(s): AD-A335801; TEC-0102; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A prototype software hyperspectral gas analysis system (HyGAS) for standoff (remote) gas detection, identification, and analysis was designed for use with developing hyperspectral imaging spectrometer systems. HyGAS incorporates traditional (FFT, background removal and library search) and innovative (neural nets for gas identification and linear discriminants for gas detection) processing methods. Neural net and linear discriminant techniques are uniquely suited for low signal-to-noise ratio field applications, processing data quickly, and reducing data storage requirements, all important considerations for real-time exploitation and automated applications. HyGAS incorporates an interactive display-based system, where five spatial images and fifteen spectral plots can be displayed simultaneously. HyGAS applies spectral techniques of gas analysis to hyperspectral image cubes, providing a method of detecting and identifying gases and mapping regional extent and concentration. HyGAS is supplied with synthetic image cubes to simulate datasets collected by a hyperspectral imaging system over a possible gas release event covering the LWIR spectral region (approx. 8-12 microns) with specifications selected to match the point spectronometers used to develop the neural net and linear discriminant techniques.
DTIC
Remote Sensing; Gas Analysis; Imaging Spectrometers; Real Time Operation

19980037592 Wyoming Univ., Dept. of Chemistry, Laramie, WY USA
Site-Selective Spectroscopy of Adsorbates on Mineral Surfaces using FTIR ***Final Report, Sep. 1994 - Sep. 1997***
Carron, Keith T., Wyoming Univ., USA; Jan. 05, 1998; 73p; In English
Contract(s)/Grant(s): F49620-94-I-0419; AF Proj. 3484
Report No.(s): AD-A335796; TR-5-31862; AFRL-SR-BL-TR-98-0117; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The montmorillonite clay modification was studied by DRIFT spectroscopy. The modifiers we used were the nonionic modifiers n-heptadecanonitrile (C16 nitrile) and hexadecanamide (C16 amide) which are biologically inert and degradeable. The interaction mechanisms between these modifiers and the montmorillonite clay were investigated. It is found that the polar groups of the modifiers can interact with the specific Si (delta+)-O (delta-)-M(n+) structure of montmorillonite through dipole-ion and dipole-dipole interactions to form a stable complexes. The investigation of a possible hydrolysis of C16 nitrile on the montmorillonite interlayer surface indicated that at a strong acidic condition, the C16 nitrile can be hydrolyzed to form C16 amide which interacts with the montmorillonite clay interface to form a stable ring structure. These results are desirable in the possible application of the modified montmorillonite clay as a waste water treatment agent. The structure of Aldrich humic acid (AHA) and its metal coordination ability are investigated by transmittance Fourier Transform InfraRed (FTIR) spectroscopy, isotopic substitution and reactive substitution were used to assign the IR spectra. A characteristic redox reaction and model compounds were also used for studying a macromolecular AHA. Structure studies have indicated that catechol analogues and phthalic acid analogues are the main functional groups of AHA. It was found that the metal coordination ability of AHA was affected by functional group's characteristics and solution pH. AHA showed higher metal coordination ability at neutral conditions than that at acidic conditions.

Catechol analogues coordinate with metal cations to form metal-semiquinone complexes through an oxidation-chelation mechanism.
DTIC
Infrared Spectroscopy; Waste Treatment; Waste Water; Clays; Nitriles; Amides

19980037593 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA
Ab Initio and Nonlocal Density Functional Study of 1,3,5-trinitro-s-triazine (RDX) Conformers ***Final Report***
Rice, Betsy M., Army Research Lab., USA; Chabalowski, Cary F., Army Research Lab., USA; Jan. 1998; 44p; In English
Report No.(s): AD-A335728; ARL-TR-1586; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Geometry optimizations and normal-mode analyses of three conformers of 1,3,5-trinitro-s-triazine (RDX) are performed using second-order Moller-Plesset (MP2) and nonlocal density functional theory (DFT) methods. The density function used in this study is B3LYP. The three conformers of RDX are distinguished mainly by the arrangement of the nitro groups relative to the ring atoms of the RDX molecule. NO2 groups arranged in either pseudo-equatorial or axial positions are denoted with (E) or (A), respectively. The axial-axial-equitorial (AAE) conformer has Cs symmetry and is the structure in the room-temperature-stable crystal (alpha-RDX). The axial-axial-axial (AAA) and equitorial-equitorial-equitorial (EEE) conformers have C3v symmetry, a symmetry consistent with vapor and beta-solid infrared (IR) spectra. The AAE and AAA conformers are studied at the MP2/6-31G*, B3LYP/6-31G*, and B3LYP16-311+G** levels, and the EEE conformer is studied using the B3LYP density function and the 6-31G* and 6-311+G** basis sets. The geometric parameters and IR spectra of the AAA conformer are in good agreement with experimental gas-phase and beta-solid data, supporting the hypotheses derived from experiment that the AAA structure is the most probable conformer in vapor-phase and beta-solid R DX. The B3LYP/6-311+G** structures and simulated IR spectra are in closest agreement with experimental data. The MP2/6-31G* structures and spectra are in poorest agreement with experiment.
DTIC
Crystals; Infrared Spectra; Optimization; RDX; Stability; Symmetry; Vapor Phases; Vapors

19980037672 Defence Research Establishment Suffield, Ralston, Alberta Canada
Packed Capillary Liquid Chromatography Electrospray Mass Spectrometry and Tandem Mass Spectrometry of Hydrolysed HT and HQ
DAgostino, Paul A., Defence Research Establishment Suffield, Canada; Provost, Lionel R., Defence Research Establishment Suffield, Canada; Hancock, James R., Defence Research Establishment Suffield, Canada; Jan. 1998; 27p; In English
Report No.(s): AD-A335365; DRES-SR-691; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Packed capillary column liquid chromatography (LC)-electrospray mass spectrometry (ESI-MS) and tandem mass spectrometry (MS/MS) were used to identify munitions grade mustard hydrolysis products, including five longer chain diols, two partial hydrolysis products and three ether/thioether macrocycles. All ESI-MS data were collected under collisionally activated dissociation (CAD) conditions optimized to facilitate acquisition of both molecular and product ion information that could be useful for structural identification purposes. Interpretation of the ESI-MS data enabled characterization of the diols resulting from hydrolysis of all three principal sulfur vesicants, bis(2-chloroethyl)sulfide (mustard or H), bis(2-chloroethylthio)ethane (sesquimustard or Q) and bis(2- CHLOROETHYLTHIO)ETHYLether (T), as well as novel products not previously associated with sulfur vesicant hydrolysis. The reported ESI-MS data could prove valuable for the identification of thiodiglycol and other sulfur vesicant hydrolysis products in samples collected by the Canadian Forces, during base cleanup operations or in support of United Nations Chemical Weapons Convention inspections.
DTIC
Chemical Warfare; Mass Spectroscopy; Liquid Chromatography

19980037674 Helsinki Univ. of Technology, Dept. of Engineering Physics and Mathematics, Espoo, Finland
Resonance Ionization Spectroscopy with Pulsed Multimode Dye Lasers: Experiments and Simulations
Lauranto, Heikki, Helsinki Univ. of Technology, Finland; 1997; 72p; In English; ISBN 951-22-3593-5; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this thesis, the method of resonance ionization spectroscopy with pulsed multimode dye lasers has been studied both experimentally and numerically. The starting point of the thesis has been a particular application, namely, isomer selective resonance ionization of niobium for the determination of the fast neutron fluence in a nuclear reactor. In order to find an appropriate excitation scheme for isomer selective RIS of Nb, hyperfine splittings of several energy levels of Nb were determined. As the result, the splittings of all the tabulated J = 1/2 levels that could be utilized in triple-resonance excitation and ionization of Nb are now known. The single-pulse spectra were measured with a spectrometer based on the Fizeau interferometer. In order to facilitate the adjust-

ment and optimization of the device in the pulse-spectrum measurements, a detailed investigation of its interference pattern was performed. The most striking feature of the pattern is that, to the second order in the wedge angle, the pattern is self-imaging. The deviation of the exact pattern from the second-order approximation is manifested as fringe shifts, which have a bearance on the optimization of the angle of incidence or, equivalently, of the location of the detection plane. The numerical studies on resonance excitation and ionization with pulsed, fluctuating multimode fields were performed using Monte Carlo simulations. In the simulation model, the atoms are described in the density matrix or amplitude formalism, and the inherent field fluctuations are imitated by abrupt jumps in the values of the field parameters. Such simulations produce not only the expectation values of the ionization signal, but also the whole signal distributions. Some basic features of the excitation with fluctuating fields in different noise scenarios were studied with a simple three-level model of atom coupled to two pulsed fields. Such simulations were also applied to study a particular excitation scheme of Nb that seems to be a promising candidate for isomer selective resonance ionization of Nb. For that purpose, the simulation model was expanded to comprise the hyperfine splittings of the energy levels, and the degeneracy of the hyperfine levels with respect to the magnetic quantum number. The calculations show that, in order to achieve the required isomer selectivity with fluctuating multimode lasers, (at least) three resonant excitation steps have to be utilized.
Author
Resonance; Ionization; Spectroscopy; Dye Lasers; Experimentation; Simulation

19980038253 Tsentralni Aerogidrodinamicheskii Inst., Moscow, USSR
Experimental Investigation of Combustion Stabilization in Supersonic Flow Using Free Recirculation Zones ***Final Report***
Aug. 1997; 57p; In English
Contract(s)/Grant(s): F61708-96-W0291
Report No.(s): AD-A336192; SPC-96-4043; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Final report summarizes shortly main results of the quarterly reports and presents experimental results on self-ignition and combustion stabilization in supersonic flow using free recirculation zone. Tests are conducted at hypersonic facility TsAGI T-131B. Measurements are performed in a nearly matched supersonic jet at the exit of two-dimensional channel over Mach number range M=2.O-2.8 at stagnation temperature range T(sub t)=1200-1400 K. initial thickness of jet was equal 67 mm. Self-ignition and stabilization are obtained at T(sub t)=1400 K. Self-ignition was absent at T(sub t)=1200 K, 1300 K. Thickness of free recirculation zone was about 25-30 mm.
DTIC
Experimentation; Combustible Flow; Stabilization; Supersonic Jet Flow

19980038270 North Carolina Univ., Dept. of Mathematics, Charlotte, NC USA
Parallel Multi-Scale Algorithms and Applications to Combustion and Turbulence ***Final Report, 1 Jun. 1994 - 31 May 1996***
Cai, Wei, North Carolina Univ., USA; Oct. 24, 1996; 19p; In English
Contract(s)/Grant(s): F49620-94-I-0317
Report No.(s): AD-A336704; AFRL-SR-BL-TR-98-0146; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this project, the main objective was to develop multi-resolution wavelet algorithm to study the flame acceleration and to understand the mechanism of the transition of deflagration to detonation. In the first half year of the project. The author completed the study of two-dimensional detonation waves based on hybrid high order methods (a combination of high order Essentially Non-Oscillatory (ENO) methods and spectral methods and Shock Tracking methods). The result on the detonation waves was published in the AIAA Journal. In the remaining time of the two years, first, the author completed the theoretical and algorithmic studies of the adaptive wavelet method, which could handle non-periodic boundary conditions and non-linear time dependent PDE's (The result was published in the SIAM Journal of Numerical Analysis). Secondly, the author implemented the adaptive wavelet methods for the solution of one-dimensional flame propagation; thirdly, the author developed a FORTRAN code WL2D (more than 13,000 lines) for the two-dimensional multi-scale wavelet algorithms with an efficient data structure and implemented a second order implicit factorized scheme for the adaptive wavelet methods.
DTIC
Algorithms; Applications Programs (Computers); Combustion; Turbulence; Flame Propagation; Wavelet Analysis; Data Structures

19980038370 Sandia National Labs., Albuquerque, NM USA
Demonstration Plan for the Evaluation of Field-Transportable Gas Chromatography/Mass Spectroscopy Technologies
Feb. 1998; 13p; In English
Report No.(s): AD-A338005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this document is to provide a strategy for collecting data that can be used to fairly and thoroughly evaluate the performance of field transportable GC/MS technologies for measuring volatile organic compounds in soil, soil gas and ground water. This demonstration is being conducted under the auspices of the Consortium for Site Characterization Technology (CSCT). The planning and execution of the demonstration is a collaborative effort between the Department of Energy's Sandia National Laboratories (demonstration planning, execution, data evaluation, and report preparation), the environmental technology demonstration programs at the Savannah River Site (SRS) and Wurtsmith AFB, which help to coordinate site logistics, and the technology developers (demonstration plan preparation and review, technology operation, and data evaluation). The primary objectives of the demonstration are: (1) to verify vendor claims regarding technology performance, (2) to determine how well each developer's technology performs in comparison to conventional laboratory analytical methods and protocols, (3) to determine the logistical and economic resources needed to operate each instrument, and (4) to produce a verified data set for use in considering the technology for future use in hazardous waste site investigations, for assessing the performance of remediation technologies, and for post-clean up monitoring.
DTIC
Evaluation; Technologies; Mass Spectroscopy; Gas Chromatography; Ground Water; SOIls

19980040074 Texas A&M Univ., College Station, TX USA
Synthesis, Characterization, and Ion Exchange Properties of a Sodium Nonatitanate, Na4Ti9O20*xH2O
Graziano, Gina M., Texas A&M Univ., USA; Feb. 02, 1998; 98p; In English
Report No.(s): AD-A336755; TR-97-164; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
During the Cold War, the Hanford Weapons Site in Richland, Washington, produced weapons grade plutonium which first needed to be separated from the other products using the PUREX process (plutonium and uranium extraction). As a byproduct of this process, millions of cubic meters of highly acidic radioactive waste were produced which are now stored in million gallon tanks at the Hanford site. Over the years, some tanks have been known to leak and some are even in danger of exploding. Because of these problems, the waste needs to be removed from these tanks and given permanent, safe storage. The purpose of this research is to produce a more efficient ion exchanger to separate the highly radioactive isotopes (90SR, 137Cs and transuranics) from the large quantities of inert salts. The smaller volume of high level waste produced can then be vitrified in glass and stored, while the low level waste can be poured into less expensive cement and glass.
DTIC
Ion Exchanging; Radioactive Wastes

19980040934 Texas A&M Univ., Dept. of Chemistry, College Station, TX USA
Preparation of Cu Nanoclusters within Dendrimer Templates, *1 Aug. 1997 - 28 Feb. 1998*
Zhao, M., Texas A&M Univ., USA; Sun, L., Texas A&M Univ., USA; Crooks, R. M., Texas A&M Univ., USA; Feb. 17, 1998; 20p; In English
Contract(s)/Grant(s): N00014-93-I-1338
Report No.(s): AD-A337681; TR-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A new template synthesis strategy for preparing Cu nanoclusters within dendrimer 'nanoreactors' is demonstrated. Hydroxyl-terminated polyamidoamine (PAMAM) dendrimers of generation higher than 2 act as monodispersed templates as well as stabilizers for nanocluste r synthesis. Cu(2+) ions are first quantitatively sorbed into the dendrimer via a strong coordinative interaction with interior amines and then chemically reduced to yield Cu nanoclusters. The nanoclusters are composed of a well-defined number of atoms. Importantly, cluster size can be controlled by varying the size of the host dendrimer nanoreactor (16-atom Cu cluster in G4 and 64-atom Cu cluster in G6 dendrimers). The clusters remain trapped within the dendrimers for extended periods of time, do not agglomerate, and do not precipitate. The clusters can also be oxidized to yield dendrimer-encapsulated Cu(2+).
DTIC
Copper; Ions; Metals; Agglomeration

19980040935 California Inst. of Tech., Pasadena, CA USA
Workshop On Dynamics and Control of Combustion Instabilities in Propulsion and Power Systems *Final Report, 1 Apr. - 31 Dec. 1997*
Marsden, Jerrold E., California Inst. of Tech., USA; Feb. 04, 1998; 3p; In English, 20-22 Nov. 1997, Pasadena, CA, USA; Sponsored by California Inst. of Tech., USA
Contract(s)/Grant(s): F49620-97-I-0296
Report No.(s): AD-A337682; AFRL-SR-BL-TR-98-0205; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The workshop reinforced the idea that a combination of analysis, simulation, and experiment continues to be a feasible approach to the problem of combustion instabilities. Control of these instabilities is very important to industry and provides a challenge to theory and simulation.
DTIC
Dynamic Control; Propulsion System Configurations; Propulsion System Performance

19980040943 Stanford Univ., Dept. of Chemistry, Stanford, CA USA
New High-Pressure Diagnostic Technique ***Final Report, 1 Aug. 1993 - 31 Jul. 1996***
Zare, Richard N., Stanford Univ., USA; Oct. 21, 1996; 8p; In English
Contract(s)/Grant(s): F49620-93-I-0442; AF Proj. 3484
Report No.(s): AD-A337737; SPO-12382; AFRL-SR-BL,XC-TR-98-0191; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our research goal was to develop nonintrusive, laser-based optical diagnostic tools for the investigation of trace amounts of molecular species in hostile environments such as plasmas, flashes, flames and other combustion forms. by extending our study on spectroscopic applications of degenerate four-wave mixing (DFWM), we proposed to exploit a new absorption technique, Cavity Ring-Down Spectroscopy (CRDS), which is, in many ways, complementary to other methods for the investigation of the transient species, radicals, and ions present in harsh luminous environments. A spatial profile of CH3 absolute concentration near the hot filament was determined by CRDS using a topological method - Abel inversion of the spatial profile of CH3 absorbance. No rotational lines are resolved from CH3 because of predissociation. A two photons laser induced fluorescence (LIF) scheme is proposed to measure atomic hydrogen. The spatial temperature profile near the Filament at 20 Torr of pure H2 at different filament temperatures was measured in the same reactor we measured CH3. This measurement, combined with the CH3 spatial profile gives a better understanding of the two most important gas phase radical species in the hot filament diamond CVD process.
DTIC
Laser Induced Fluorescence; Vapor Deposition; Temperature Profiles; Molecular Gases

26
METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

19980037422 NASA Lewis Research Center, Cleveland, OH USA
Method and Apparatus for the Detection of Hydrogen Using a Metal Alloy
Hunter, Gary W., Inventor, NASA Lewis Research Center, USA; Sep. 16, 1997; 10p; In English; Division of US-Patent-Appl-SN-366645, filed 30 Dec. 1994
Patent Info.: Filed 22 Mar. 1996; NASA-Case-LEW-15956-2; US-Patent-5,668,301; US-Patent-Appl-SN-621028; US-Patent-Appl-SN-366645; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A hydrogen sensitive metal alloy contains palladium and titanium to provide a larger change in electrical resistance when exposed to the presence of hydrogen. The alloy is deposited on a substrate and a thin film and connected across electrical circuitry to provide a sensor device that can be used for improved sensitivity and accuracy of hydrogen detection.
Official Gazette of the U.S. Patent and Trademark Office
Technologies; Hydrogen; Sensitivity; Electrical Resistance

19980037599 NASA Lewis Research Center, Cleveland, OH USA
Method and Apparatus for Producing a Substrate with Low Secondary Electron Emissions
Jensen, Kenneth A., Inventor, NASA Lewis Research Center, USA; Curren, Arthur N., Inventor, NASA Lewis Research Center, USA; Roman, Robert F., Inventor, NASA Lewis Research Center, USA; Jan. 27, 1998; 4p; In English; Continuation of abandoned US-Patent-Appl-SN-331392, filed 26 Oct. 1994
Patent Info.: Filed 25 Jan. 1996; NASA-Case-LEW-15898-3; US-Patent-5,711,860; US-Patent-Appl-SN-591125; US-Patent-Appl-SN-331392; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

The present invention is directed to a method and apparatus for producing a highly-textured surface on a copper substrate with only extremely small amounts of texture-inducing seeding of masking material. The texture-inducing seeding material is delivered to the copper substrate electrically switching the seeding material in and out of a circuit loop.
Official Gazette of the U.S. Patent and Trademark Office
Electron Emission; Secondary Emission; Substrates; Copper

19980038155 California Univ., Riverside, CA USA

Molecular Mechanisms of Biosynthesis of Metal-Binding PCs ***Final Report, 1 Nov. 1993 - 31 Oct. 1997***

Mehra, Rajesh, California Univ., USA; Oct. 31, 1997; 19p; In English

Contract(s)/Grant(s): F49620-94-I-0047; AF Proj. 2312

Report No.(s): AD-A335807; AFRL-SR-BL-TR-98-0093; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our research during the project period was directed towards three fundamental aspects of PCs: (1) metal-chelation by PCs, (2) sulfide complexes of PCs and (3) biosynthesis of PCs. We have made thorough investigations of the metal-binding properties of PCs and published data that provides benchmark information on the Ag(1), Cu(1), Cd(2), Hg(2) and Pb(2)-binding characteristics of these plant metal binding peptides. We have carried out detailed investigations on the sulfide complexes of PCs (PCs) that profoundly influence the metal-binding capacity of these peptides. In addition, these complexes have the potential to be very useful reagents for the detoxification of a variety of organic contaminants. Using a complementation cloning strategy, we have isolated a gene that is required for Cd tolerance and PC production. Although this gene did not turn out to be PC synthase, it provides us a good picture of the role of heme biosynthesis in PC production.

DTIC

Molecular Dynamics; Sulfides; Biosynthesis; Reagents; Molecular Interactions

19980038363 Universal Energy Systems, Inc., Dayton, OH USA

The Phase Evolution, Creep and Tensile Behavior of Two-Phase Orthorhombic Titanium Alloys ***Final Report, Aug. 1993 - Sep. 1997***

Boehlert, Carl, Universal Energy Systems, Inc., USA; Dec. 1997; 260p; In English

Contract(s)/Grant(s): F33615-96-C-5258; AF Proj. 2306

Report No.(s): AD-A337559; WL-TR-97-4118; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The phase evolution, creep, and tensile behavior were studied for near Ti2AlNb and Ti12Al-38Nb O+BCC alloys. Monolithic materials were produced through conventional thermomechanical processing techniques. Heat treatment and TEM studies estimated the temperature ranges for the respective phase fields and a pseudobinary diagram based on Ti=50at.% was constructed. The aging-transformation behavior was studied in detail. O-phase precipitation within BCC-dominated microstructures resulted in significant Room Temperature (RT) strengthening. The BCC phase was vital for imparting RT ductility. The deformation observations and calculated creep exponents and activation energies suggested that three creep mechanisms are dominating the secondary creep behavior. For low applied stress, Coble creep characteristics were exhibited. For intermediate stresses, the minimum creep rates were proportional to square delta/GS and fiducial-line experiments revealed grain boundary sliding and grain boundary cavitation. For high stresses, the stress exponents were greater than or equal to 3.5 and a high density of dislocations were observed, indicative of a dislocation climb mechanism. Overall, the sub-transus processed and heat-treated microstructures contained much smaller grain sizes than super-transus microstructures and this resulted in worse creep resistance. For targeted low-to-intermediate stress and intermediate temperature applications, grain size is the dominant microstructural feature influencing the creep behavior of O+BCC alloys.

DTIC

Creep Properties; Creep Strength; Tensile Creep; Titanium Alloys

19980040956 NERAC, Inc., Tolland, CT USA

Tungsten and Tungsten Alloy Powder Metallurgy. (Latest citations from the Ei Compendex*Plus database)

Mar. 1998; In English

Report No.(s): PB98-853484; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning tungsten powder preparation and processing. Studies include sintering, densification, shrinkage, phase analysis, and heat treatment. The physical and mechanical properties of tungsten powder metal products are included. The effects of additives and particle size on the sintering and sintered articles are also described. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Tungsten Alloys; Powder Metallurgy; Metal Powder; Bibliographies

19980041203 Naval Surface Warfare Center, Bethesda, MD USA

Lead Corrosion in Exhibition Ship Models

Wegner, Dana, Naval Surface Warfare Center, USA; Nov. 1997; 29p; In English

Report No.(s): AD-A336754; NSWCCD-TR-97/014; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Lead has been a popular metal for fabricating fittings for exhibition ship models. It has been attractive because it is easy to obtain, soft and easy to fashion, and it melts at a relatively low temperature. However, lead fittings frequently corrode. Corrosion may be so severe as to completely consume the piece, leaving behind a white or gray residue popularly, and aptly, called ”lead disease,” ”lead rot,” ”lead cancer,” or ”lead bloom.” In the exhibition ship modeling community there has been considerable speculation about what causes lead to severely corrode, how to arrest the process in pieces already installed, and how to prevent corrosion in the future. This report compiles some of the technical literature on the subject and relates that literature, in practical terms, to ship modelers and to museum staff who are unable to obtain the advice and services of objects conservators. Organic compounds are the chief category of substances acting harshly upon lead and acetic acid is among the most destructive of these compounds.
DTIC
Ships; Scale Models; Lead (Metal); Corrosion

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

19980037666 Iowa State Univ. of Science and Technology, Dept. of Chemistry, Ames, IA USA
Theoretical Studies of Reaction Surfaces ***Final Report, 1 Sep. 1993 - 31 Aug. 1997***
Gordon, Mark S., Iowa State Univ. of Science and Technology, USA; Aug. 31, 1997; 19p; In English
Contract(s)/Grant(s): F49620-93-I-0556; AF Proj. 3484
Report No.(s): AD-A336516; AFRL-SR-BL-TR-98-0151; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The main goals of this program have been to develop new, more effective methods for performing accurate ab initio electronic structure calculations and to use these methods for the prediction of molecular structure, bonding and reactivity, especially for main group species and reactions of interest to the Air Force. From the theoretical point of view, the principle accomplishments have been extensive development of approaches and codes for performing electronic structure calculations in parallel, continued development of methods for interfacing electronic structure calculations with dynamics, the development of a new model for treating solvation, and the development and implementation of a gridless approach to density functional theory. Applications have ranged from the development of very accurate and extensive potential energy surfaces for A+HB reactions (to interface with the experiments of Neumark and Zare) to the role of catalysts in the hydrosilation reaction and the formation of silsesquioxanes to extensive studies of reactions involved in both main group and transition metal Chemical Vapor Deposition (CVD) to broad-based studies of cage molecules (using our new parallel capabilities) that are potential precursors for new materials, electronic and optical devices, and catalysts.
DTIC
Numerical Analysis; Molecular Structure; Computer Programming; Applications Programs (Computers)

19980037948 Army Research Lab., Aberdeen Proving Ground, MD USA
Materials Science Studies of High-Temperature Superconducting Ceramic Oxides ***Final Report, May 1988 - Mar. 1993***
Vezzoli, G. C., Army Research Lab., USA; Chen, M. F., Army Research Lab., USA; Craver, F., Army Research Lab., USA; Katz, R. N., Army Research Lab., USA; Dec. 1997; 253p; In English
Report No.(s): AD-A335338; ARL-TR-1570; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

Herein is presented the results of a comprehensive program of research aimed at understanding the materials science and the mechanistic physics of high-temperature superconducting oxides. This comprehensive research program has identified the materials properties that are consistently associated with high-Tc superconductors and has shown that the mechanism that gives rise to the phenomenon of high-Tc superconductivity is associated with bound holes that are due to charge-transfer excitations at high frequency. The latter are a result of the high internal electric field present in high-Tc materials, owing to the asymmetry of the crystal structure. The interaction of bound holes with free electrons and the interaction of local spin fluctuations with the spin of free electrons generate a charge density wave and a spin density wave that cause Cooper pairing.
DTIC
High Temperature Superconductors; Ceramics; Oxidizers; Superconductors (Materials)

19980037951 Massachusetts Univ., Dept. of Chemistry, Lowell, MA USA

Characterizing the NLO Chromophore Orientation of Polymeric Film by Electroabsorption Spectroscopy, *1 Jun. 1997 - 30 Sep. 1998*

Yang, Ke, Massachusetts Univ., USA; Wang, X., Massachusetts Univ., USA; Kim, W., Massachusetts Univ., USA; Jain, A., Massachusetts Univ., USA; Li, L., Massachusetts Univ., USA; Jan. 14, 1998; 8p; In English

Contract(s)/Grant(s): N00014-90-J-1148

Report No.(s): AD-A335232; TR-1148-96-07; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The dispersion of third-order nonlinear coefficients chi-3 1133 and chi-3 3333 of three different NLO (nonlinear optical) polymer films were determined by electroabsorption spectroscopy. The first material investigated is an epoxy-based polymer BP-2A-NT, with azobenzene NLO chromophore 4-((4- NITROPHENYL)(AZO)PHENYL)AZO)aniline in its side chain. The other materials are two polydiacetylenes, poly(BPOD) and poly(4-BCMU), in which the delocalized polymer chains contribute to the third-order nonlinearity. The complex spectrum of chi-3 3333 of each material is very similar in shape to corresponding chi-3 1133 spectrum. The ratio of chi-3 3333 to chi-3 1133 is 3.2 for BP-2A-NT, 1.5 for both poly(BPOD) and poly(4-BCMU). These ratios indicate that the distribution of the side-chain NLO chromophores of BP-2A-NT is very close to three-dimensional isotropy, and the distribution of the main-chain chromophores of poly (BPOD) and poly (4-BCMU) is concentrated on the film lane.

DTIC

Polymeric Films; Nonlinear Optics; Photoabsorption; Chromophores

19980037955 Texas Research Inst., Inc., Materials Engineering Research Lab., Austin, TX USA

High Pressure Gas Permeation and Liquid Diffusion Studies of Coflon and Tefzel Thermoplastics

Morgan, G. J., Texas Research Inst., Inc., USA; Campion, R. P., Texas Research Inst., Inc., USA; Feb. 19, 1997; 56p; In English

Contract(s)/Grant(s): NAG10-153

Report No.(s): NASA/CR-97-207610; NAS 1.26:207610; CAPP/M.4-Rev-C; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The life of fluid-carrying flexible or umbilical pipes during service at elevated temperatures and pressures depends inter alia on their resistance to attack by the fluids present and the rate at which these fluids are absorbed by the pipe lining materials. The consequences of fluid ingress into the thermoplastic lining could mean a) a reduction in its mechanical strength, to increase chances of crack formation and growth and thus a loss of integrity, b) the occurrence of permeation right through the lining material, with pressure build- up in the outer pipe wall construction (of flexible pipes) or chemical attack (from a hostile permeant) on outer layers of reinforcements. Therefore it is important within this project to have relevant permeation data for Coflon and Tefzel thermoplastics: the former is plasticised, the latter is not. A previous report (CAPP/M.2) described experimental equipment and techniques used by MERL when measuring high pressure (up to 5000 psi) gas permeation and liquid diffusion through thermoplastic samples cut from extruded bar or pipe, and provided the basic theory involved. Norsk Hydro are also performing gas permeation tests on pipe sections, at up to 100 bars (1450 psi) pressure or so, and reporting separately. Some comparisons between data from Norsk Hydro and MERL have been made herein. The tests should be considered as complementary, as the Norsk Hydro test has the obvious benefit of using complete pipe sections, whilst MERL can test at much higher pressures, up to 1000 bar if necessary. The sophisticated analytical measuring equipment of Norsk Hydro can distinguish the individual components of mixed gases and hence the various permeation-linked coefficients whereas MERL, in using pressure increase at constant volume to determine permeation rate, is limited to obtaining single gas data, or apparent (or representative) coefficients for a mixed gas as a whole. Except for the initial fluid diffusion data for Tefzel described in CAPP/M.2, the present report covers all aspects of fluid permeation and diffusion for Coflon and Tefzel, including all the pen-neation data accumulated in the project to date. Test gases have mainly been methane (CH4) and carbon dioxide (CO2). More high pressure (HP) gas permeation tests have been performed since the last issue of this report, most being concerned with changes in permeation characteristics brought about by ageing in various relevant fluids. This revision supersedes previous issues.

Derived from text

Pipes (Tubes); Permeating; Gas Mixtures; Pressure Measurement; Gas Transport; Crack Initiation; Diffusion; Compressed Gas

19980038045 Michigan Univ., Dept. of Materials Science and Engineering, Ann Arbor, MI USA

DURIP Proposal for An Ion-Assisted Sputtering Deposition System for Nano-Modulated Oxide Coatings *Final Report, 1 Aug. 1995 - 31 Jul. 1997*

Chen, I-Wei, Michigan Univ., USA; Jan. 21, 1998; 3p; In English

Contract(s)/Grant(s): F49620-95-I-0472

Report No.(s): AD-A336396; AFRL-SR-BL-TR-98-0144; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Major requisitions include a four-target RF sputtering system from Denton Vacuum Industry and a scanning probe microscope system from AutoProbe Inc. Using these instruments, oxide thin films of various compositions and heterostructures have been prepared to investigate the phenomenon of fatigue. It was found that the rate of degradation is sensitive to the type of charge carriers. Electrons accelerate fatigue while holes do not. It was also found that fatigue has a strong frequency dependence. This is best characterized by monitoring the increase of coercive field as a function of frequency after fatigue. The latter phenomenon has been modeled using interface dynamics involving bow-out and defect trapping.
DTIC
Thin Films; Deposition; Electrons; Frequencies; Oxide Films; Radio Frequencies

19980038056 NASA Langley Research Center, Hampton, VA USA
Polyimide Fibers
St.Clair, Terry L., Inventor, NASA Langley Research Center, USA; Fay, Catharine C., Inventor, NASA Langley Research Center, USA; Working, Dennis C., Inventor, NASA Langley Research Center, USA; Sep. 23, 1997; 8p; In English; Provisional US-Patent-Appl-SN-021206, filed 3 Jul. 1996
Patent Info.: Filed 13 Aug. 1996; NASA-Case-LAR-15526-1; US-Patent-5,670,256; US-Patent-Appl-SN-689760; US-Patent-Appl-SN-021206; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche
A polyimide fiber having textile physical property characteristics and the process of melt extruding same from a polyimide powder. Polyimide powder formed as the reaction product of the monomers 3.4'-ODA and ODPA, and endcapped with phthalic anhydride to control the molecular weight thereof, is melt extruded in the temperature range of 340? C. to 360? C. and at heights of 100.5 inches, 209 inches and 364.5 inches. The fibers obtained have a diameter in the range of 0.0068 inch to 0.0147 inch; a mean tensile strength in the range of 15.6 to 23.1 ksi; a mean modulus of 406 to 465 ksi; and a mean elongation in the range of 14 to 103%.
Official Gazette of the U.S. Patent and Trademark Office
Polyimides; Fibers; Tensile Strength; Molecular Weight; Height

19980038148 Massachusetts Inst. of Tech., Cambridge, MA USA
The Materials Science and Mathematics of Block Copolymers ***Final Report, 15 Jun. 1994 - 14 Sep. 1997***
Thomas, Edwin L., Massachusetts Inst. of Tech., USA; Feb. 15, 1998; 7p; In English
Contract(s)/Grant(s): F49620-94-I-0357; AF Proj. 3484
Report No.(s): AD-A337850; AFRL-SR-BL-TR-98-0208; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This project focused on the fundamentals of microstructural control of polymer materials for three-dimensional nano-composites. Our recent discovery of the double gyroid (DG) micro-domain structure in a poly styrene-poly isoprene di-block copolymer (Macromolecules 27, 4063 (1994)) opened the possibility for exploiting this new tri-continuous structure for physical properties. Two possible applications we envisioned were for tough thermoplastic elastomers and for nano-porous membranes. In the past three years, we demonstrated the attainment of this specific tri-continuous triply periodic micro-domain structure in two different tri-block copolymers for the first time , through targeted composition and chain architecture. Additionally we have collaborated with mathematicians to model the complex DG structure employing level set functions and to develop a software application program for producing 2D projections of the 3D micro-domain structure for comparison to TEM images. Two poly styrene-poly isoprene ABA tri-block samples which have the DG structure were synthesized and their large strain deformation behavior investigated using a combination of transmission electron microscopy (TEM) and in situ synchrotron small angle x-ray scattering (SAXS). Additionally, tri-block DG samples based on poly(pentamethyl disilylstyrene)-poly isoprene were synthesized and successfully converted into nano-porous materials via ozonolysis etching of the poly isoprene networks.
DTIC
Block Copolymers; Three Dimensional Composites; Microstructure

19980038151 Purdue Univ., West Lafayette, IN USA
Modeling and Visualization for Polymers, Surfaces and Biomolecules ***Final Report, 1 Sep. 1993 - 31 May 1997***
Bajaj, Chandrajit L., Purdue Univ., USA; Oct. 14, 1997; 7p; In English
Report No.(s): AD-A336368; AFRL-SR-BL-TR-98-0103; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Problems in the representation of molecular surfaces using different spline representations have been studied. The suitability of these patch representations for visualizing scalar functions has been analyzed.
DTIC
Biochemistry; Scalars; Splines; Models; Flow Visualization; Ferroelectric Materials

19980038220 Gupta (Pradeep K.), Inc., Clifton Park, NY USA

Traction Data Analysis. Part 2: Behavior of Some Aerospace Fluids and Lubricants ***Final Report, Mar. 1995 - Jan. 1996***

Gupta, Pradeep K., Gupta (Pradeep K.), Inc., USA; Jan. 1997; 674p; In English

Contract(s)/Grant(s): F33615-92-C-5902; AF Proj. 2421

Report No.(s): AD-A337803; WL-TR-97-4036; No Copyright; Avail: Issuing Activity (Wright Lab., Wright-Patterson AFB, OH), Hardcopy, Microfiche

Traction behavior of several aerospace fluids and lubricants is correlated to simplified Newtonian models based on viscosity pressure temperature relations. Model coefficients are derived by regression analysis of experimental traction data, which is obtained by a conventional rolling disk type test machine. The model provides fast computation of traction coefficient under prescribed operating conditions and it is well suited for complex computer codes for the dynamic performance simulation of rolling bearings, where the required amount of computer time often imposes severe restrictions on use of the model for practical design. DTIC

Lubricating Oils; Traction; Regression Analysis

19980038231 Michigan Technological Univ., Physics Dept., Houghton, MI USA

Modeling of Defects in Ceramic Oxides YAG ***Final Report, 1 Sep. 1996 - 31 Aug. 1997***

Pandey, Ravi, Michigan Technological Univ., USA; Jan. 18, 1998; 31p; In English

Contract(s)/Grant(s): F49620-96-I-0445

Report No.(s): AD-A337444; AFRL-SR-BL-TR-98-0143; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Native point defects in Y3Al5O12 (YAG) were studied in the framework of the pair-potential approximation coupled with the shell model description of the lattice ions. For the perfect lattice, a new set of potential parameters were obtained which reproduce structure, elastic and dielectric constants of YAG very well. The calculated formation energies for native point defects predict that the antisite disorder is preferred over the Frenkel and Schottky like disorder in YAG. The calculated value of the distortion caused by the antisite Y(sub Al) are in excellent agreement with the EXAFS measurements. In non-stoichiometric YAG, the calculated reaction energies indicate that excess Y2O3 or Al2O3 is likely to be accommodated by the formation of antisite rather than vacancies in the lattice. DTIC

Point Defects; Yttrium-Aluminum Garnet

19980038237 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA

Gallium Arsenide Nitride: A New Material for Optical Interconnects on Silicon Circuits ***Final Report, Jan. - Dec. 1996***

Ballantyne, J. M., Michigan Univ., USA; Oct. 1997; 31p; In English

Contract(s)/Grant(s): F30602-96-2-0024; AF Proj. 4600

Report No.(s): AD-A337171; RL-TR-97-162; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A proposed direct bandgap ternary material, lattice matchable to silicon, was explored in this exploratory effort. About a dozen molecular beam epitaxy growth runs were performed on gallium arsenide and gallium phosphide, and growths analyzed via Auger spectroscopy, x-ray diffraction, and transmission electron microscopy. Up to 20% nitrogen was incorporated. Single crystal quality material with about 2% nitrogen was detected. Segregation into gallium nitride and gallium arsenide was always seen. DTIC

Ternary Alloys; Gallium Arsenides; Molecular Beam Epitaxy; Gallium Nitrides

19980038256 Florida Univ., Gainesville, FL USA

A Focused, Fundamental Study on the Environmental Degradation of Ceramic Materials in Aerospace Structures, Volume 1 ***Final Report, 1 Jun. 1993 - 31 May 1997***

Whitney, E. D., Florida Univ., USA; Adair, James H., Florida Univ., USA; Holloway, Paul H., Florida Univ., USA; Mecholsky, John J., Jr., Florida Univ., USA; Winefordner, James D., Florida Univ., USA; May 31, 1997; 373p; In English

Contract(s)/Grant(s): F49620-93-I-1349

Report No.(s): AD-A336490; AFRL-SR-BL-TR-98-0136-Vol-1; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

A multidisciplinary team of investigators from the University of Florida, the University of Utah, and the University of Tennessee conducted a comprehensive, integrated study on the wear and fatigue of ceramic and metal materials for aerospace applications. The work was focused on a study of wear and fatigue in the context of the materials silicon nitride (Si3N4) and M-50 steel, and environments relevant to hybrid bearings in advanced turbine engines. The four year program was initiated in May, 1993 and concluded at the end of May, 1997. This document represents the fourth and final report of the program. A fundamental approach

was employed to better understand the combined effects of mechanical stress, chemical environment, and high temperatures on wear and fatigue. Individual expertise on the research team spanned the disciplines of material science, chemistry, mechanics, and physics needed to understand the tribo-chemical nature of wear and fatigue. The program was also strongly coupled to industry and national laboratories to better facilitate transfer of the fundamental knowledge and technology to be developed into existing military and commercial systems. The primary objectives in the study were to: (1) develop and evaluate ex-situ and selected in-situ methods to detect wear; (2) develop a broad-based fundamental understanding of wear and wear mechanisms; (3) develop rolling contact fatigue maps for the hybrid bearing systems; (4) develop lifetime predictions for wear and rolling contact fatigue based on the ex-situ and in-situ wear detection methods; and (5) develop surface modification systems for hybrid bearing systems that either aid in wear detection or act to minimize wear damage.
DTIC
Turbine Engines; Silicon Nitrides; Ceramics; Wear; Fatigue (Materials)

19980038265 Colorado School of Mines, Dept. of Metallurgical Engineering, Golden, CO USA
Crystallization and Microstructural Control of Ferroelectric Thin-Films and Glass-Ceramics ***Final Report, 1 Apr. 1995 - 31 Dec. 1997***
Haun, Michael J., Colorado School of Mines, USA; Jan. 31, 1998; 13p; In English
Contract(s)/Grant(s): N00014-95-I-0613
Report No.(s): AD-A337154; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Research on solution-derived ferroelectric thin-films and melt-derived ferroelectric glass-ceramics was conducted in parallel with considerable overlap in the compositions studied and the evaluations of the crystallization behavior, microstructural development, and resulting properties. Lead germane based ferroelectric thin films were developed with a room temperature pyroelectric coefficient over 90% of the single crystal value, and a pyroelectric figure of merit exceeding the highest reported value for oriented lead titanate films. New glass-ceramic compositions were developed based on the crystallization of ferroelectric phases of lead zirconate titanate and lead zinc niobate in lead borosilicate glass matrices. The compositions in glass powder form densified at temperatures less than 900 deg C by a combination of viscous and liquid phase sintering mechanisms. Crystallization of an interconnected microstructure of the ferroelectric phases was critical to produce ferroelectric properties, and allow electrical poling for piezoelectric and pyroelectric activity. This research demonstrates the feasibility of developing ferroelectric glass-ceramic compositions with low processing temperatures that utilize powder processing techniques, such as pressing, screen printing, or tape casting, and indicates the potential incorporation of these materials into multi-component microelectronic packages as sensors and actuators.
DTIC
Crystallization; Microstructure; Ferroelectricity; Thin Films; Ceramics; Borosilicate Glass

19980038355 Cincinnati Univ., Dept. of Electrical and Computer Engineering, OH USA
(AASERT 94) Intelligent Control of Materials Processes ***Final Report, 1 Sep. 1994 - 31 Aug. 1997***
Garrett, Patrick H., Cincinnati Univ., USA; Jan. 1998; 3p; In English
Contract(s)/Grant(s): F49620-94-I-0383
Report No.(s): AD-A337453; AFRL-SR-BL-TR-98-0171; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A systematic set of experiments has been performed to determine the effect of temperature, oxygen, precursor composition, and precursor flow rate on the gas phase of chemical vapor deposition.
DTIC
Vapor Deposition; Vapor Phases; Process Control (Industry)

19980038356 California Univ., Dept. of Materials Science and Engineering, Los Angeles, CA USA
Advanced Ceramics from Liquid Solution ***Final Report, 1 Dec. 1993 - 30 Nov. 1997***
Mackenzie, John D., California Univ., USA; Jan. 1998; 50p; In English
Contract(s)/Grant(s): F49620-94-I-0071; AF Proj. 2303
Report No.(s): AD-A337472; AFRL-SR-BL-TR-98-0163; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This Final Technical Report for the period from 1 December 1993 to 30 November 1997 presents a summary of research performed on two classes of materials prepared by the sol-gel method. The first class of materials is the Ormosils. Work has been carried out on the structure and mechanical properties of Ormosils and a model was presented to account for the dependence of properties on structures, especially for the rubbery Ormosils. The high temperature stability of rubbery Ormosils was found to be enhanced by the presence of small amounts of iron ions. A method was developed for the introduction of carbon black into Ormosils. Aerogels of 95% porosity were known to be extremely fragile. by the incorporation of poly dimethyl siloxane, the result-

ant Ormosils were rendered rubbery. The second family of materials investigated consisted of ferroelectric thin films. Single crystals of KNbO3 films were grown by the sol-gel method, etched to form waveguides and shown to emit green light when impinged upon by infrared lasers due to second harmonic effects. A theory was postulated which enabled the understanding of ferroelectric behavior shown by amorphous oxide films. A technique was developed for the successful growth of multilayered stack of alternating oxide films. A new family of organic-inorganic hybrids which showed ferroelectric behavior was discovered by the involrporation of an organic dye, TDP, into the SiO2 network of a gel containing minute crystallite of LiNbO3 or BaTiO3.
DTIC
Ferroelectricity; Sol-Gel Processes; Single Crystals; Oxide Films; Ceramics

19980040056 NERAC, Inc., Tolland, CT USA
Ceramics Technology: Aircraft Engine Component Applications. (Latest citations from the Ei Compendex*Plus database)
Dec. 1997; In English; Page count unavailable.
Report No.(s): PB98-851504; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning ceramic materials that are resistant to heat, wear, and corrosion processes, and their use in aircraft engines. Fabrication techniques for ignition system components, combustion chamber parts, gas-path seals, turbine rotors, stators, nozzles, blades, and heat exchangers are discussed. Ceramic metal composites suitable for aircraft gas turbine engine components are also considered.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Ceramics; Aircraft Engines; Engine Parts

19980040946 Delaware Univ., Newark, DE USA
Effects of Short Polymeric Fibers on Crack Development in Clays ***Final Report***
Shulley, Stacy, Delaware Univ., USA; Leshchinsky, Dov, Delaware Univ., USA; Ling, Hoe I., Delaware Univ., USA; Dec. 1997; 102p; In English
Report No.(s): AD-A337814; WES-TR-REMR-GT-25; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Many levees are constructed of clay soils which have a tendency to shrink and swell when subjected to periods of drying and wetting. Desiccation cracking occurs allowing percolation of rain water which may result in shallow surface slides. The purpose of this research was to assess the feasibility of using randomly distributed short polypropylene fibers to reduce the development of desiccation cracks in clay. Tests were conducted on laboratory prepared clays with a wide range of plasticity indices as well as natural clay samples. The fibers were effective in reducing the amount of desiccation cracking that occurs in clay samples. The fibers were effective in reducing the amount of desiccation cracking that occurs in clays subjected to drying. However, when subjected to wet/dry cycles, the fibers were not effective. The fibers increased the tensile strength of the clay and provided a ductile behavior that was not present in the samples without fibers. The fibers has no effect in reducing clay surface disintegration due to erosion. Limited testing with a grid-like fiber, with a bearing capacity failure in pullout as opposed to adhesion for the poly propylene fiber, indicated a modified fiber design could better interact with clays.
DTIC
Fiber Composites; Fiber-Matrix Interfaces; Clays; Cracks; Plastic Properties; Propylene

19980040963 NERAC, Inc., Tolland, CT USA
Transparent and Conductive Tin Oxide and Indium Oxide Films. (Latest citations from the INSPEC Database)
Feb. 1998; In English
Report No.(s): PB98-852783; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the characterization, fabrication, and applications of transparent and conductive tin oxide (SnO) and indium oxide (InO) films. The optical, electrical, structural, electrochemical, and photochemical properties of SnO and InO thin films are examined. The citations examine methods of fabricating SnO and InO semiconductor thin films and optical films, using chemical vapor deposition, reactive sputtering, spray pyrolysis, and electron beam deposition. Applications include gas sensors, solar cells, thin film resistors, and various thin film devices. Citations concerning indium-tin oxide films are excluded and examined in a separate bibliography.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Tin Oxides; Oxide Films; Indium Oxides

19980040964 NERAC, Inc., Tolland, CT USA

Thermochromic Materials and Devices. (Latest citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Feb. 1998; In English

Report No.(s): PB98-852700; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations of selected patents concerning thermochromic materials and devices that vary in color in response to temperature changes. The design and manufacture of thermochromic inks, pigments, paints, dyes, semiconductors, and coatings are included. Citations also present applications in optical temperature sensors and indicators, writing and drawing devices, erasable display, battery testers, variable reflectance mirrors, and security devices. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Thermochromatic Materials

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

19980040938 University of North Texas, Dept. of Chemistry, Denton, TX USA

Improved Economical and Environmentally Benign Routes for the Large-Scale Synthesis of 1,3,3-Trinitroazetidine ***Final Report, 15 Sep. 1996 - 31 Dec. 1997***

Marchand, Alan P., University of North Texas, USA; Jan. 12, 1998; 79p; In English

Contract(s)/Grant(s): N00014-96-I-1279

Report No.(s): AD-A337691; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Several routes for the synthesis of 1,3,3-trinitroazetidine (TNAZ) have been investigated. of these the most promising new method involves studies of additions of various reagents, X-Y, across the highly strained C(3)-N sigma-bond in 3-ethyl-1-azabicyclo1.1.0butane. In the course of this study, it was found that reaction of this highly strained bicyclic amine with in situ generated HNO2 resulted in addition across the C(3)-N bond with concomitant N-nitrosation of the resulting intermediate azetidine, thereby affording N-nitroso-3-ethyl-3-nitro azacyclo butane (54%), which was oxidized subsequently to the corresponding dinitro azetidine, N-nitro-3-ethyl-3-nitro azacyclo butane (89%). These observations provide the basis of the method with which a novel synthesis of TNAZ has been developed. Our objectives include: (1) development of improved methods to permit scale-up of our previously published TNAZ synthesis, and (2) introduction of environmentally benign routes to prepare key synthetic intermediates.

DTIC

Reagents; Ethyl Compounds

31
ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

19980037421 National Inst. of Standards and Technology, Gaithersburg, MD USA

Journal of Research of the National Institute of Standards and Technology, Volume 102

1997; ISSN 1044-677X; 120p; In English

Report No.(s): PB98-114515; LC-89-656121; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The contents of this paper include the following: Compendium on the NIST Radionuclidic Assays of the Massic Activity of (63)Ni and (55)Fe Solutions Used for an International Intercomparison of Liquid Scintillation Spectrometry Techniques; Developments for a New Spectral Irradiance Scale at the National Institute of Standards and Technology; On-Demand Generation of a Formaldehyde-in-Air Standard; New Method for Measuring Statistical Distributions of Partial Discharge Pulses; Guidelines for Expressing the Uncertainty of Measurement Results Containing Uncorrected Bias; A Distribution-Independent Bound on the Level of Confidence in the Result of a Measurement.

NTIS

Light (Visible Radiation); Scintillation

19980037428 National Space Development Agency, Program Planning and Management Dept., Tokyo, Japan

Current R and D of Rockets and Artificial Satellites in Japan

Nakamura, Kunio, National Space Development Agency, Japan; Tsuchi-to-Kiso, Ser. No. 456; Dec. 1997; Volume 44, No. 1; 16p; In English; Translated into English by NASDA

Report No.(s): NASDA-ETR-970014; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

In February, 1994, Japan successfully launched, the H-II rocket No.1 which developed entirely with Japan's domestic technology, making it known that Japan had reached the highest level of the advanced space developing countries. In July, 1994, Astronaut Mukai from the National Space Development Agency of Japan(NASDA) participated in the "Second International Microgravity Laboratory (INIL-2) Program," took a precious step toward Japan's future manned space activities as Astronaut Mori who participated in the First Material Processing Test (FMPT), nicknamed "Fuwatto '92." Although the Engineering Test Satellite Type VI (ETS-VI), "Kiku No.6," was launched by the H-II rocket No.2 Unit in August, 1994, with the aim of developing the large operational satellite bus technology and the future advanced satellite communications technology, the failure that developed in the engine (apogee engine) installed on the satellite to put it on the stationary orbit forced the experiment program to be substantially changed. Special mention should be made to the fact that these events have enhanced the nation's interest in the space development in a way never seen in recent years. The H-II rocket No.3, launched in March, 1995, demonstrated a sophisticated technology of simultaneous launching of a space experiment and observation Space Flyer Unit (SFU) that was to be operated on a low altitude orbit with an altitude of about 5OO km and the Geostationary Meteorological Satellite No.5 (GMS-5), "Himawari No.5" that was to be placed on the geostationary orbit with an altitude of 36,000 km. Launching these three experimental satellites enabled the basic performance of the H-II rockets to be almost confirmed. On the basis of the achievements enumerated above, Japan is pushing forward with diverse space development programs to enlarge its scope of activities in the future. In the field of the development of space transportation systems, larger size, higher reliability, and less costs are sought for to respond to demand in artificial satellite launching that is expected to sharply increase in the future. In international projects, as typically represented by the international space station program, the form of implementation is shifting from the conventional U.S.-lead system to an equal-footing cooperative system for all participants more and more required to share roles such as logistics one another.
Author

Research and Development; Artificial Satellites; Japan; Satellite Communication; Broadcasting; Communication Satellites; Rocket Vehicles

19980037703 NASA Kennedy Space Center, Cocoa Beach, FL USA

Balanced Rotating Spray Tank and Pipe Cleaning and Cleanliness Verification System

Caimi, Raoul E. B., Inventor, NASA Kennedy Space Center, USA; Thaxton, Eric A., Inventor, NASA Kennedy Space Center, USA; Jan. 13, 1998; 12p; In English

Patent Info.: Filed 29 Mar. 1995; NASA-Case-KSC-11694; US-Patent-5,706,842; US-Patent-Appl-SN-412674; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A system for cleaning and verifying the cleanliness of the interior surfaces of hollow items, such as small bottles, tanks, pipes and tubes, employs a rotating spray head for supplying a gas-liquid cleaning mixture to the item's surface at a supersonic velocity. The spray head incorporates a plurality of nozzles having diverging cross sections so that the incoming gas-liquid mixture is first converged within the spray head and then diverged through the nozzles, thereby accelerating the mixture to a supersonic velocity. In the preferred embodiment, three nozzles are employed; one forwardly facing nozzle at the end of the spray head and two oppositely facing angled nozzles exiting on opposite sides of the spray head which balance each other, and therefore impart no net side load on the spray head. A drive mechanism is provided to rotate the spray head and at the same time move the head back and forth within the item to be cleaned. The drive mechanism acts on a long metal tube to which the spray head is fixed, and thus no moving parts are exposed to the interior surfaces of the items to be cleaned, thereby reducing the risk of contamination.
Official Gazette of the U.S. Patent and Trademark Office

Sprayers; Rotation; Tanks (Containers); Cleanliness; Cleaning

19980037723 Texas Univ., Mechanical Engineering, Austin, TX USA

Proceedings (8th): Solid Freeform Fabrication Symposium ***Final Report, 15 Apr. - 31 Dec. 1997***

Bourell, D. L., Texas Univ., USA; Beaman, J., Texas Univ., USA; Marcus, H. L., Texas Univ., USA; Crawford, R., Texas Univ., USA; Barlow, J., Texas Univ., USA; Jan. 14, 1997; 770p; In English, 11-13 Aug. 1997, Austin, TX, USA

Contract(s)/Grant(s): N00014-97-I-0453

Report No.(s): AD-A335248; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

The Eighth Solid Freeform Fabrication (SFF) Symposium, held at The University of Texas in Austin on August 11-13, 1997, was attended by 200 national and international researchers. Papers addressed SFF issues in computer software, machine design, materials synthesis and processing, and integrated manufacturing. Eighty-six presentations were made, 65 oral presentations and 21 poster presentations. The diverse domestic and foreign attendees represented industrial users, SFF machine manufacturers, universities, and government. We believe that documenting the constantly changing state of SFF art as represented by these Proceedings will serve both the people presently involved in this fruitful technical area as well as the large flux of new researchers and users entering the field. We are pleased to report that the SFF Symposium attracted a large number of young scientists this year. We had 51 students from 21 universities (4 international universities), approximately 25% of the entire meeting participants. The Organizing Committee has always valued the role of technical meetings as a venue for graduate students in research.
DTIC

Conferences; Software Engineering; Computer Programs; Computer Aided Design; Composite Materials

19980037725 SRI International Corp., Menlo Park, CA USA

Process Models for Infrared Focal Plane Array Flexible Manufacturing ***Final Report***

Berding, M. A., SRI International Corp., USA; Dec. 1997; 89p; In English

Contract(s)/Grant(s): F49620-95-C-0004

Report No.(s): AD-A335302; SRI-6452FR; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective of this work is to assist industry in its efforts to devise a flexible manufacturing means for production of high performance Hg(1-x)Cd(x)Te-based focal plane arrays at reduced costs. The program has focused on the properties of impurities and native defects in the material, and how they subsequently impact the device performance. We find that the cation vacancy is a single acceptor in x = 0.2 material, contrary to previous findings. We have explained the inactive incorporation of the group VII elements under mercury-deficient conditions. We have shown that the group I elements have a large fraction of interstitial incorporation, thereby explaining their fast diffusion. We have predicted a model for the amphoteric behavior of arsenic, and have explained its behavior in liquid phase epitaxy from both the tellurium-melts and the mercury-melts. Annealing strategies for activation arsenic as a p-type dopant following growth by molecular beam epitaxy have also been suggested. Our modeling of the MBE growth surface indicates that growth rates are fastest on the (211)B surface, but that there will be fewer grown-in defects on the (211)A surface.
DTIC

Models; Infrared Radiation; Manufacturing; Focal Plane Devices; Product Development

19980037933 Naval Research Lab., Washington, DC USA

Numerical Modeling of Fire Suppression Using Water Mist. 1. Gaseous Methane-Air Diffusion Flames

Prasad, K., Naval Research Lab., USA; Li, C., Naval Research Lab., USA; Kailasanath, K., Naval Research Lab., USA; Ndubizu, C., Naval Research Lab., USA; Ananth, R., Naval Research Lab., USA; Jan. 19, 1998; 52p; In English

Report No.(s): AD-A337904; NRL/MR/6410--98-8102; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report is the first in a series dealing with the numerical modeling of fire suppression using water mist. The focus of this report is on the suppression of gas jet diffusion flames using fine water droplets. A two continuum formulation is used in which the gas phase and the water mist are both described by equations of the eulerian form. The model is used to obtain a detail understanding of the physical processes involved during the interaction of water mist and flames. The relative contribution of various mist suppression mechanisms is studied. The effect of droplet diameter, spray injection density and velocity on water mist entrainment into the flames and flame suppression is quantified. Droplet trajectories are used to identify the regions of the flame where the droplets evaporate and absorb energy. Finally, the model is used to determine the water required for extinction, and this is reported in terms of the ratio of the water supply rate to the fuel flow rate.
DTIC

Mist; Fires; Diffusion Flames; Gas Jets; Mathematical Models

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COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications. For related information see also 04 Aircraft Communications and Navigation and 17 Space Communications, Spacecraft Communications, Command and Tracking. For search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation.

19980037238 Maryland Univ., Center for Automation Research, College Park, MD USA
Advanced Automatic Target Recognition ***Final Report, Jul. 1993 - Jun. 1997***
Rosenfeld, Azriel, Maryland Univ., USA; Sep. 05, 1997; 9p; In English
Contract(s)/Grant(s): ARPA Order A369
Report No.(s): AD-A335690; AFRL-SR-BL-TR-98-0104; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The grant supported research on techniques for recognizing targets in visible, infrared, laser radar, synthetic aperture radar and high-range aperture radar data. Empirical probability density functions of 'probe values' gives rise to a method of estimating probability that a target of known shape is present. Two-stage Constant False Alarm rate detectors were introduced to reduce the PA rate in the presence of SAR speckled images. A complete algorithm for wide-area site models using polarimetric SAR was developed. Multiscale methods were introduced into HRR classification with an improvement in performance. Operator-theoretic methods were successfully employed in the important area of detection and location of roads and nearby targets.
DTIC
Probability Density Functions; Radar Imagery; Radar Range; Synthetic Aperture Radar; Target Recognition

19980037430 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
The Telecommunications and Data Acquisition Report ***Progress Report, Oct. - Dec. 1995***
Yuen, Joseph H., Editor, Jet Propulsion Lab., California Inst. of Tech., USA; Feb. 15, 1996; 188p; In English; Also announced as 19980037431 through 19980037441
Contract(s)/Grant(s): NAS7-918
Report No.(s): NASA/CR-95-112584; NAS 1.26:112584; JPL-TDA-PR-42-124; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This quarterly publication provides archival reports on developments in programs managed by JPL's Telecommunications and Mission Operations Directorate (TMOD), which now includes the former Telecommunications and Data Acquisition (TDA) Office. In space communications, radio navigation, radio science, and ground-based radio and radar astronomy, it reports on activities of the Deep Space Network (DSN) in planning, supporting research and technology, implementation, and operations. Also included are standards activity at JPL for space data and information systems and reimbursable DSN work performed for other space agencies through NASA. The preceding work is all performed for NASA's Office of Space Communications (OSC). TMOD also performs work funded by other NASA program offices through and with the cooperation of OSC. The first of these is the Orbital Debris Radar Program funded by the Office of Space Systems Development. It exists at Goldstone only and makes use of the planetary radar capability when the antennas are configured as science instruments making direct observations of the planets, their satellites, and asteroids of our solar system. The Office of Space Sciences funds the data reduction and science analyses of data obtained by the Goldstone Solar System Radar. The antennas at all three complexes are also configured for radio astronomy research and, as such, conduct experiments funded by the National Science Foundation in the U.S. and other agencies at the overseas complexes. These experiments are either in microwave spectroscopy or very long baseline interferometry. Finally, tasks funded under the JPL Director's Discretionary Fund and the Caltech President's Fund that involve TMOD are included.
Author
Space Communication; Data Acquisition; Communication Networks; Systems Engineering; Telecommunication

19980037431 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
The Effect of Aperture Averaging Upon Tropospheric Delay Fluctuations Seen with a DSN Antenna
Linfield, R., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 1-7; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 314-30-11-90-02; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The spectrum of tropospheric delay fluctuations expected for a DSN antenna at time scales less than 100 s has been calculated. A new feature included in these calculations is the effect of aperture averaging, which causes a reduction in delay fluctuations on time scales less than the antenna wind speed crossing time, approx. equal to 5-10 s. On time scales less than a few seconds, the Allan deviation sigma(y)(Delta(t)) is proportional to (Delta(t))(exp +1), rather than sigma(y)(Delta(t)) proportional to (Delta(t))(exp -1/6) without aperture averaging. Due to thermal radiometer noise, calibration of tropospheric delay fluctuations

with water vapor radiometers will not be possible on time scales less than approx. equal to 10 s. However, the tropospheric fluctuation level will be small enough that radio science measurements with a spacecraft on time scales less than a few seconds will be limited by the stability of frequency standards and/or other nontropospheric effects.
Author
Deep Space Network; Apertures; Radiometers; Spacecraft Tracking; Space Communication; Data Links; Spacecraft Communication; Antenna Design; Thermal Noise; Troposphere

19980037432 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
An Overview of the GOLD Experiment Between the ETS-6 Satellite and the Table Mountain Facility
Wilson, K. E., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 8-19; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 314-30-12-00-01; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The Ground/Orbiter Lasercomm Demonstration is a demonstration of optical communications between the Japanese Engineering Test Satellite (ETS-VI) and an optical ground transmitting and receiving station at the Table Mountain Facility in Wrightwood, California. Laser transmissions to the satellite are performed for approximately 4 hours every third night when the satellite is at apogee above Table Mountain. The experiment requires the coordination of resources at the Communications Research Laboratory (CRL), JPL, the National Aeronautics and Space Development Agency (NASDA) Tsukuba tracking station, and NASA's Deep Space Network at Goldstone, California, to generate and transmit real-time commands and receive telemetry from the ETS-VI. Transmissions to the ETS-VI began in November 1995 and are scheduled to last into the middle of January 1996, when the satellite is expected to be eclipsed by the Earth's shadow for a major part of its orbit. The eclipse is expected to last for about 2 months, and during this period there will be limited electrical power available on board the satellite. NASDA plans to restrict experiments with the ETS-VI during this period, and no laser transmissions are planned. Posteclipse experiments are currently being negotiated. GOLD is a joint NASA-CRL experiment that is being conducted by JPL in coordination with CRL and NASDA.
Author
Optical Communication; Satellite Communication; Real Time Operation; Telemetry; Atmospheric Effects; Data Transmission; Laser Applications; Deep Space Network; Communication Networks; Engineering Test Satellites; Ground Stations

19980037433 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
Preliminary Analysis of Fluctuations in the Received Uplink-Beacon-Power Data Obtained From the GOLD Experiments
Jeganathan, M., Jet Propulsion Lab., California Inst. of Tech., USA; Wilson, K. E., Jet Propulsion Lab., California Inst. of Tech., USA; Lesh, J. R., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 20-32; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 314-30-12-00-01; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Uplink data from recent free-space optical communication experiments carried out between the Table Mountain Facility and the Japanese Engineering Test Satellite are used to study fluctuations caused by beam propagation through the atmosphere. The influence of atmospheric scintillation, beam wander and jitter, and multiple uplink beams on the statistics of power received by the satellite is analyzed and compared to experimental data. Preliminary analysis indicates the received signal obeys an approximate lognormal distribution, as predicted by the weak-turbulence model, but further characterization of other sources of fluctuations is necessary for accurate link predictions.
Author
Engineering Test Satellites; Satellite Communication; Communication Networks; Optical Communication; Atmospheric Effects; Laser Beams; Ground Stations; Signal Transmission; Uplinking

19980037434 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
Optimum Combining of Residual Carrier Array Signals in Correlated Noises
Tan, H. H., Jet Propulsion Lab., California Inst. of Tech., USA; Liang, R., California Univ., USA; Suen, P.-H., California Univ., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 33-52; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 315-91-20-20-55; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

An array feed combining system for the recovery of signal-to-noise ratio (SNR) loss due to antenna reflector deformation has been implemented and is currently being evaluated on the Jet Propulsion Laboratory 34-m DSS-13 antenna. The current signal-combining system operates under the assumption that the white Gaussian noise processes in the received signals from different array elements are mutually uncorrelated. However, experimental data at DSS 13 indicate that these noise processes are indeed mutually correlated. The objective of this work is to develop a signal-combining system optimized to account for the mutual cor-

relations between these noise processes. The set of optimum combining weight coefficients that maximizes the combined signal SNR in the correlated noises environment is determined. These optimum weights depend on unknown signal and noise covariance parameters. A maximum-likelihood approach is developed to estimate these unknown parameters to obtain estimates of the optimum weight coefficients based on residual carrier signal samples. The actual combined signal SNR using the estimated weight coefficients is derived and shown to converge to the maximum achievable SNR as the number of signal samples increases. These results are also verified by simulation. A numerical example shows a significant improvement in SNR performance can be obtained, especially when the amount of correlation increases.
Author
Deep Space Network; White Noise; Signal to Noise Ratios; Maximum Likelihood Estimates; Antenna Arrays; Signal Processing; Reflector Antennas; Random Noise

19980037435 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
Channel Capacity of an Array System for Gaussian Channels With Applications to Combining and Noise Cancellation
Cheung, K.-M., Jet Propulsion Lab., California Inst. of Tech., USA; Vilnrotter, V., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 53-62; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 314-30-11-20-02; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

A closed-form expression for the capacity of an array of correlated Gaussian channels is derived. It is shown that when signal and noise are independent, the array of observables can be replaced with a single observable without diminishing the capacity of the array channel. Examples are provided to illustrate the dependence of channel capacity on noise correlation for two- and three-channel arrays.
Author
Channel Capacity; Communication Networks; Signal to Noise Ratios; Channel Noise; Cancellation; Random Noise

19980037437 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
Progressive Transmission and Compression of Images
Kiely, A. B., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 88-103; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 315-91-20-20-52; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

We describe an image data compression strategy featuring progressive transmission. The method exploits subband coding and arithmetic coding for compression. We analyze the Laplacian probability density, which closely approximates the statistics of individual subbands, to determine a strategy for ordering the compressed subband data in a way that improves rate-distortion performance. Results are presented for a test image.
Author
Images; Data Compression; Data Transmission; Communication Networks; Image Processing; Signal Distortion

19980037438 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA
Ka-Band Monopulse Antenna-Pointing Systems Analysis and Simulation
Lo, V. Y., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 104-112; In English; Also announced as 19980037430
Contract(s)/Grant(s): RTOP 315-91-20-20-55; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

NASA's Deep Space Network (DSN) has been using both 70-m and 34-m reflector antennas to communicate with spacecraft at S-band (2.3 GHz) and X-band (8.45 GHz). to improve the quality of telecommunication and to meet future mission requirements, JPL has been developing 34-m Ka-band (32-GHz) beamwave guide antennas. Presently, antenna pointing operates in either the open-loop mode with blind pointing using navigation predicts or the closed-loop mode with conical scan (conscan). Pointing accuracy under normal conscan operating conditions is in the neighborhood of 5 mdeg. This is acceptable at S- and X-bands, but not enough at Ka-band. Due to the narrow beamwidth at Ka-band, it is important to improve pointing accuracy significantly (approx. 2 mdeg). Monopulse antenna tracking is one scheme being developed to meet the stringent pointing-accuracy requirement at Ka-band. Other advantages of monopulse tracking include low sensitivity to signal amplitude fluctuations as well as single-pulse processing for acquisition and tracking. This article presents system modeling, signal processing, simulation, and implementation of Ka-band monopulse tracking feed for antennas in NASA/DSN ground stations.
Author
Deep Space Network; Monopulse Antennas; Signal Processing; Superhigh Frequencies; Spacecraft Communication; Directional Antennas; Systems Simulation; Mathematical Models; Conical Scanning

19980037439 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA

Modeling and Analysis of the DSS-14 Antenna Control System

Gawronski, W., Jet Propulsion Lab., California Inst. of Tech., USA; Bartos, R., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 113-142; In English; Also announced as 19980037430

Contract(s)/Grant(s): RTOP 314-30-55-02-19; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

An improvement of pointing precision of the DSS-14 antenna is planned for the near future. In order to analyze the improvement limits and to design new controllers, a precise model of the antenna and the servo is developed, including a finite element model of the antenna structure and detailed models of the hydraulic drives and electronic parts. The DSS-14 antenna control system has two modes of operation: computer mode and precision mode. The principal goal of this investigation is to develop the model of the computer mode and to evaluate its performance. The DSS-14 antenna computer model consists of the antenna structure and drives in azimuth and elevation. For this model, the position servo loop is derived, and simulations of the closed-loop antenna dynamics are presented. The model is significantly different from that for the 34-m beam-waveguide antennas.

Author

Antenna Design; Mathematical Models; Computerized Simulation; Antenna Components; Feedback Control; Control Systems Design; Finite Element Method; Waveguide Antennas; Beam Waveguides; Controllers

19980037440 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA

A Prototype Ka-/Ka-Band Dichroic Plate With Stepped Rectangular Apertures

Chen, J. C., Jet Propulsion Lab., California Inst. of Tech., USA; Stanton, P. H., Jet Propulsion Lab., California Inst. of Tech., USA; Reilly, H. F., Jr., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 143-152; In English; Also announced as 19980037430

Contract(s)/Grant(s): RTOP 314-30-11-00-15; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

A prototype five-layer Ka-/Ka-band dichroic plate was fabricated and measured. This dichroic plate was designed to pass Ka-band uplink (34.2-34.7 GHz) and to reflect Ka-band downlink (31.8-32.3 GHz) for dual-frequency operation in the Deep Space Network to support the future Cassini mission. The theoretical calculation and the experimental measurement of the reflected resonant frequencies were within 0.24 percent for circular polarization. The computer program, which was used to design the dichroic plate with stepped apertures, was then verified.

Author

Deep Space Network; Downlinking; Uplinking; Extremely High Frequencies; Dichroism; Plates (Structural Members); Fabrication; Circular Polarization

19980037441 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA

Sequence-of-Events-Driven Automation of the Deep Space Network

Hill, R., Jr., Jet Propulsion Lab., California Inst. of Tech., USA; Fayyad, K., Jet Propulsion Lab., California Inst. of Tech., USA; Smyth, C., Jet Propulsion Lab., California Inst. of Tech., USA; Santos, T., Jet Propulsion Lab., California Inst. of Tech., USA; Chen, R., Jet Propulsion Lab., California Inst. of Tech., USA; Chien, S., Jet Propulsion Lab., California Inst. of Tech., USA; Bevan, R., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 153-173; In English; Also announced as 19980037430

Contract(s)/Grant(s): RTOP 314-30-11-70-03; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

In February 1995, sequence-of-events (SOE)-driven automation technology was demonstrated for a Voyager telemetry downlink track at DSS 13. This demonstration entailed automated generation of an operations procedure (in the form of a temporal dependency network) from project SOE information using artificial intelligence planning technology and automated execution of the temporal dependency network using the link monitor and control operator assistant system. This article describes the overall approach to SOE-driven automation that was demonstrated, identifies gaps in SOE definitions and project profiles that hamper automation, and provides detailed measurements of the knowledge engineering effort required for automation.

Author

Deep Space Network; Downlinking; Telemetry; Data Transmission; Expert Systems; Data Processing; Spacecraft Communication; Voyager 1 Spacecraft

19980037555 NERAC, Inc., Tolland, CT USA

Wavelet Transforms and Analysis. (Latest citations from the NTIS Bibliographic Database)

Jan. 1998; In English; Page count unavailable.

Report No.(s): PB98-851884; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning wavelet transforms and analysis used in signal and image processing. Wavelet compression, transmission, decomposition, representation, and coding are discussed. References also review applications in aerospace, the military, medicine, government, and commerce.
NTIS
Wavelet Analysis; Signal Processing; Fourier Transformation; Image Processing

19980037576 Ohio State Univ., Columbus, OH USA
The Acoustic-to-Articulatory Mapping of Voiced and Fricated Speech ***Final Report***
Riegelsberger, Edward L., Ohio State Univ., USA; Jan. 1997; 179p; In English
Report No.(s): AD-A334781; AFRL-SR-BL-TR-98-0028; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
Acoustic-to-articulatory mapping is the estimation of a time-varying vocal-tract shape from an acoustic waveform. While most research in acoustic-to-articulatory mapping considers only purely voiced speech, this dissertation investigates the problem for speech that includes fricatives. Aspects of fricative production and perception challenge many of the assumptions and techniques used in existing acoustic-to-articulatory mapping algorithms. This work investigates these issues and extends existing techniques for the acoustic-to-articulatory mapping of purely voiced speech to unvoiced and voiced fricatives in isolation and in continuous speech. Linked-codebooks are used to examine the acoustic-to-articulatory mapping of voiced and unvoiced static fricatives. Acoustic-to-articulatory mapping performance is evaluated by analyzing articulatory estimation error for a number of synthetic fricatives and phonetic class clustering for a collection of real fricatives. Scatter plots of acoustic-to-articulatory mapping results on unvoiced fricatives demonstrate good phonetic class clustering and inter-class separability. For equivalent performance on voiced fricatives, the acoustic features had to be modified to deemphasize frequencies below 1 kHz. Linked-codebook lookup, along with dynamic programming, is used to perform acoustic-to-articulatory mapping of continuous, purely voiced speech. Direct application of the algorithm to speech containing fricatives suggests that purely voiced acoustic-to-articulatory mapping provides contextual information that can improve fricative acoustic-to-articulatory mapping. A five step procedure is developed for the dynamic acoustic-to-articulatory mapping of continuous, voiced speech containing intervocalic fricatives. A collection of vowel-fricative-vowel tokens is used for development and testing. In most cases, the estimated articulatory trajectories appear natural and form fricatives with the correct place of articulation. Occasiaonal errors occur to vowel or fricative misidentification early in the optimization process. Problems in the vowel-fricative transition and source parameter optimization ultimately limit the perceptual quality of the resynthesized speech.
DTIC
Speech; Acoustic Properties; Sound Waves

19980037609 Naval Surface Warfare Center, Bethesda, MD USA
Dielectric Materials Containing Conducting Wires: Effect on Polarization ***Final Report***
Ueberall, Herbert, Naval Surface Warfare Center, USA; Dec. 1997; 25p; In English
Report No.(s): AD-A336531; NSWCCD-TR-64-97/19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
It has become of recent interest to complement electromagnetic responses in intensity by the additional consideration of their polarizations. In order to affect the latter, media have been considered that contain inclusions of randomly distributed and oriented short, thin wires (needles), whose polarized scattering amplitudes can modify the well-known polarization of surface reflections that is governed simply by the so-called Fresnel coefficients. In the present study, we analytically obtain, for the case of a multiplicity of perfectly conducting wires imbedded in a dielectric, the corresponding wave scattering amplitudes and their superposition with the specularly surface-reflected wave amplitude when both are being generated by the same incident wave. This allows a calculation of the total returned-wave polarizations which we express by the real Stokes parameters.
DTIC
Dielectrics; Wire; Polarization (Charge Separation); Electrical Resistivity; Electromagnetic Wave Transmission

19980037620 Department of the Navy, Washington, DC USA
Fuzzy Controller for Target Intercept Guidance
Bessacini, Anthony F., Inventor, Department of the Navy, USA; Pinkos, Robert F., Inventor, Department of the Navy, USA; Sep. 23, 1997; 21p; In English; Supersedes US-Patent-Appl-SN-498812, AD-D017681.
Patent Info.: Filed 6 Jul. 1995; US-Patent-Appl-SN-498812; US-Patent-5,671,140
Report No.(s): AD-D018745; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
A target intercept guidance system for directing a steerable object, such as a torpedo. The guidance system senses the bearing and range between a first site and a second site and determines the position of the steerable object as it moves toward the second site. Two error functions are produced. The first error function represents the angle between the bearing from the steerable object

to the second site and the course of the steerable object. The second error signal represents the rate of change of that angle. These error signals are classified into first and second sensed linguistic variables based upon membership functions from the first and second sensed variable membership function sets to become fuzzy inputs that produce fuzzy output control output membership functions from a control output membership function set based upon logical manipulation of the fuzzy inputs. These fuzzy control output membership functions are converted into an output having an appropriate form for control.
DTIC
Guidance (Motion); Submarines; Launchers; Tracking (Position)

19980037623 Department of the Navy, Washington, DC USA
Hierarchical Fuzzy Controller for Beam Rider Guidance
Bessacini, Anthony F., Inventor, Department of the Navy, USA; Pin kos, Robert F., Inventor, Department of the Navy, USA; Sep. 23, 1997; 27p; In English; Supersedes US-Patent-Appl-SN-498811, AD-D017789.
Patent Info.: Filed 6 Jul. 1995; US-Patent-Appl-SN-498811; US-Patent-5,671,139
Report No.(s): AD-D018736; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A beam rider guidance system for directing a steerable object such as a torpedo. The guidance system is located at a launching vehicle and senses the bearings from the launching vehicle to a target and to the steerable object as it moves toward the target. Various error signals are then generated and classified into membership functions of different sensed variable membership function sets based upon primary and secondary goals to become fuzzy inputs to a controller that produces fuzzy output control output membership functions from a control output membership function set based upon logical manipulation of the fuzzy inputs. The control system performs this classification and selection according to some-times competing goals of excluding the torpedo from a particular operating zone while guiding the torpedo in response to a bearing through that operating zone. The selected fuzzy control output membership functions are converted into an output having an appropriate form for control subject to optional conditioning to prevent unwanted effects and assure good behavior for different tactical parameters.
DTIC
Beam Steering; Trajectories; Guidance (Motion); Beam Rider Guidance; Torpedoes

19980037679 Army Research Lab., Adelphi, MD USA
Collection of Emission from an Oscillating Dipole Inside a Sphere: Analytic Integration Over a Circular Aperture ***Final Report, Dec. 1995 - May 1997***
Pendleton, J. D., Army Research Lab., USA; Hill, Steven C., Army Research Lab., USA; Dec. 1997; 35p; In English
Contract(s)/Grant(s): DE-AI05-95OR-22401
Report No.(s): AD-A335254; ARL-TR-1399; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We describe a method for analytically integrating, over a circular aperture, the emission from an oscillating dipole inside a dielectric sphere. The model is useful for investigating fluorescence, Raman, or other emission from molecules inside spherical particles or droplets. The analysis is performed for two cases: (1) the dipole emits from a fixed orientation, and (2) the dipole emits from all orientations. In both cases, all light entering the aperture is collected. The second case models the collection of emission from a molecule that is excited repeatedly; after each excitation, it rotates to a random orientation before emitting. These results are applicable to single-molecule detection techniques employing microdroplets and to other techniques for characterizing microparticles through the use of luminescence or inelastic scattering.
DTIC
Emission; Oscillations; Numerical Analysis; Electric Dipoles

19980037681 Vympel Corp., Russia
The Concept For Creating Low Power Spaced Radar to Observe Small-Sized Debris Particles ***Final Report***
Menshikov, Alexander, Vympel Corp., Russia; Dec. 1997; 46p; In English
Contract(s)/Grant(s): F61708-96-W-0293
Report No.(s): AD-A336528; EOARD-SPC-96-4077; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Vympel Corporation as follows: Contractor shall develop a conceptual design for a low power radar system capable of detection of millimeter particles from a space based platform. The system shall be capable of long term operation and shall be designed to detect particles of one millimeter or larger passing through an area of 40,000 square meters. A system architecture shall be provided that will demonstrate the technical feasibility of the system along with estimates of power and weight requirements.
DTIC
Technology Assessment; Product Development; Millimeter Waves; Radar

19980037712 Army Research Lab., Adelphi, MD USA

Inspecting for Corrosion of Shipboard Conduits and Shield-to-Ground Adapters with Low-Bandwidth Pulsed-Current Injection ***Final Report, Mar. - Apr. 1995***

Tuttle, John E., Army Research Lab., USA; Dec. 1997; 19p; In English

Contract(s)/Grant(s): DAPR:A140

Report No.(s): AD-A335160; ARL-MR-354; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We inspected metal conduit with a low-bandwidth, pulsed-current injection. This technique, called the L/R method, has been used successfully to identify corroded cable shields on aircraft, armored vehicles, and fixed and mobile communications systems. We successfully applied this technique to the inspection of shipboard electromagnetic protective conduit. The application of this technique is described in detail and the experimental results are presented.

DTIC

Corrosion; Injection; Metals; Low Currents; Bandwidth; Inspection; Pipes (Tubes)

19980037715 Woods Hole Oceanographic Inst., Upper Ocean Processes Group, MA USA

Feasibility of Wireless Data Transmission on Ships

Hosom, David S., Woods Hole Oceanographic Inst., USA; Oct. 1997; 36p; In English

Contract(s)/Grant(s): NSF OCE-96-32461

Report No.(s): AD-A334163; WHOI-97-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report will present the results of an investigation into the feasibility of several modes of wireless data transmission including: (1) radio frequency modems, (2) acoustic modems (using the ship's steel hull for a path with a 'HullPhone'), (3) power line systems, such as X-lO units, and (4) possible power line utilization of telephone modems. There is a need for wireless data transmission on both Voluntary Observing Ships (VOS) and research ships for short-term installations. The availability of cables from remote areas on these ships is usually not good, and restrictions on installing cables prevent some useful measurements from being made. A case in point is the real time availability of measurements of sea surface temperature (SST) from VOS by sensors mounted inside the hull. Instruments for measuring SST are installed in sealed compartments that are near the waterline of the ship and often four decks below the main deck. Other applications include transmission of data from automated XBT launchers located on the aft deck to the science area and transmission of data from a cluster of meteorological instruments located at the bow of the ship to the bridge for interface to Service ARGOS or Inmarsat satellite links. Surveys of existing equipment have been made. Typical equipment has been purchased and was tested in a ship environment, including the 'HullPhone'. The results of these tests are presented. Suggestions for system configurations to meet the applications noted above are made with note of the product development required.

DTIC

Communication Satellites; Compartments; Data Links; Data Transmission; Radio Frequencies; Real Time Operation; Satellite Networks; Sea Surface Temperature; Surveys; Temperature Measurement

19980037724 Johns Hopkins Univ., Dept. of Electrical and Computer Engineering, Baltimore, MD USA

A Study of Packet Routing in Mobile Radio Networks ***Final Report***

Subbarno, Madhavi, Johns Hopkins Univ., USA; Murali, Ramaswamy, Johns Hopkins Univ., USA; Jan. 1998; 130p; In English

Contract(s)/Grant(s): DAAL03-91-C-0034

Report No.(s): AD-A335299; JHU-ARL-CR-337; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study is concerned with mobile packet radio networks. These networks are of importance in the context of tactical battlefield communications, where decentralized operation and antijam capability are desirable network attributes. The objective of this study is to conduct and document a survey of the known and available results on techniques for routing information through packet radio networks. We focus on issues that reside within the first (lower) three layers of the seven-layer Open System Interconnection (OSI) network architecture modeL Consequently, a greater emphasis is placed on issues, such as network connectivity, media access, and routing. Where available, performance evaluation methods are detailed. Finally, we present examples of commercial, state of the art wireless data networks and discuss some open problems for further study.

DTIC

Communication Networks; Radio Equipment; Packet Switching

19980037834 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Applications of Unsupervised Clustering Algorithms to Aircraft Identification Using High Range Resolution Radar

Dzung, Tri Pham, Air Force Inst. of Tech., USA; Dec. 1997; 114p; In English

Report No.(s): AD-A336314; AFIT-GE-ENG-97D-22; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Identification of aircraft from High Range Resolution (HRR) radar range profiles requires a database of information capturing the variability of the individual range profiles as a function of viewing aspect. This database can be a collection of individual signatures or a collection of average signatures distributed over the region of viewing aspect of interest. An efficient database is one which captures the intrinsic variability of the HRR signatures without either excessive redundancy typical of single-signature databases, or without the loss of information common when averaging arbitrary groups of signatures. The identification of 'natural' clustering of similar HRR signatures provides a means for creating efficient databases of either individual signatures, or of signature templates. Using a k-means and the Kohonen self organizing feature net, we identify the natural clustering of the HRR radar range profiles into groups of similar signatures based on the match quality metric used within a Vector Quantizer classification algorithm. This greatly reduces the redundancy in such databases while retaining classification performance. Such clusters can be useful in template-based algorithms where groups of signatures are averaged to produce a template. Instead of basing the group of signatures to be averaged on arbitrary regions of viewing aspect, the averages are taken over the signatures containing intake natural clusters which have been identified.
DTIC
Aircraft Detection; High Resolution; Cluster Analysis; Algorithms

19980037835 Southern Methodist Univ., Dept. of Mathematics, Dallas, TX USA
Numerical Modeling and Analysis of Transient Electromagnetic Wave Interaction with Dispersive Targets ***Final Report, 1 Dec. 1994 - 30 Nov. 1997***
Petropoulos, Peter G., Southern Methodist Univ., USA; Jan. 20, 1998; 8p; In English
Contract(s)/Grant(s): F49620-95-I-0014
Report No.(s): AD-A337890; SMU-5-26169; AFRL-SR-BL-TR-98-0195; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Analytical and numerical techniques were developed for modeling transient electromagnetic wave propagation in dispersive dielectrics. Time domain asymptotic techniques were used to understand the decay of pulses in such media and to develop energy estimates useful in RFR dosimetry. Fourth order accurate numerical schemes were proposed for such problems and analyzed. Due to the large stencil of these schemes special absorbing boundary conditions were developed and analyzed. Numerical tests indicated a four orders of magnitude superiority of our conditions over the classical techniques.
DTIC
Mathematical Models; Electromagnetic Interactions; Wave Interaction; Electromagnetic Wave Transmission

19980037921 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Wire Antenna Designed for Space Wave Radiation Over the Earth Using a Genetic Algorithm
Sandlin, Brian S., Air Force Inst. of Tech., USA; Dec. 1997; 115p; In English
Report No.(s): AD-A336349; AFIT/GE/ENG/97D-10; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
A wire antenna is designed for optimal performance at low elevation angles in the presence of a lossy half-space. A simple Genetic Algorithm (GA) and GENOCOP III software are each integrated with Numerical Electromagnetics Code Version 4.1 (NEC4.1) to optimize a wire antenna geometry for multiple objectives: power gain, azimuthal symmetry, and input impedance. The performance of the two versions of the integrated GA are compared. Several of the resulting antennas are analyzed, and an antenna is proposed for use in a Remote Intrusion Monitoring System (RIMS). Simulations suggest that the proposed antenna, which is well-matched, offers a significant increase in power gain at low elevation angles compared to the quarter-wavelength monopole. The performance of the proposed antenna surpasses that of the monopole at the necessary frequencies and a wide range of soil types. Also, the new antenna performance is not degraded by structure geometry perturbations.
DTIC
Design Analysis; Antenna Design; Wire; Monopole Antennas; Extraterrestrial Radiation

19980038146 Communications Research Centre, Ottawa, Ontario Canada
The Effects of Antenna Array Geometry and Element Pattern Uncertainty on High-Latitude HF Direction Finding
Jenkins, Robert W., Communications Research Centre, Canada; Dec. 1997; 38p; In English
Report No.(s): AD-A337866; CRC-RP-97-006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Simulation studies are described which model the performance of a sampled-aperture HF direction-finding (DF) system operating with specified array geometries in the presence of both single reflection (point source) and multiple reflection/scattering (extended source) ionospheric radio propagation typical of observed high-latitude night-time conditions. A multiple direction estimator was used to obtain direction estimates; the deterministic maximum likelihood algorithm was selected for this, following a comparison between it and the MUSIC algorithm. Array pattern errors, based on previous phase and amplitude pattern measure-

ments and numerical modeling, were included in the simulation. The performance is characterized in terms of the ability of the DF system to see a weaker point source in the presence of the extended source. The array apertures in wavelengths (or alternately operating frequencies for a fixed-size array) over which good performance was obtained was limited at the low end by the resolving power of the array, and at the high end, by the narrow array beamwidth and the limited number of directions available to the DF algorithm to describe the situation. pattern errors reduced performance significantly; much more at small array apertures (2.5 wavelengths or less) than at larger apertures (5 wavelengths or more). of the four 12-element array geometries tested, the 'star' array, consisting of three arms with its smallest spacings at its extremities, performed best over the widest range of aperture sizes (or alternatively, operating frequencies).
DTIC
Antenna Radiation Patterns; Antenna Arrays; Direction Finding

19980038150 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Effects of Near-Field Scatterers on Space-Time Adaptive Processing
Fitton, Jonathan W., Air Force Inst. of Tech., USA; Dec. 1997; 129p; In English
Report No.(s): AD-A336385; AFIT/GE/ENG/97D-12; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Near-field scatterers, such as the wing of an airplane, can affect the ability of the processor to null out clutter and jammer signals. The target, clutter, and jammer signals will reflect off the near-field scatterers into the array and appear to be coming from a direction different from their true sources. This thesis develops a theoretical model for the direct path and scattered path signals from the target, clutter, and jamming signals. The optimum weight vector, normally computed using the steering vector to the target and the covariance matrix of the undesired signals, must now include the effects of the scattered signals as well. This thesis shows that the space-time steering vector for the scattered signal can be written in a form similar to the direct path signal. The total space-time steering vector of a signal is the sum of the direct path and scattered path steering vectors associated with that signal.
DTIC
Near Fields; Scattering; Signal Processing; Radar Echoes; Matrices (Mathematics)

19980038204 Army Research Lab., Adelphi, MD USA
RCS Validation of a Missile-Shaped Target at W-Band ***Final Report, Oct. 1996 - Oct. 1997***
Goldman, Geoffrey H., Army Research Lab., USA; Jan. 1998; 36p; In English
Report No.(s): AD-A336968; ARL-TR-1563; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In a comparison of measured, simulated, and theoretical calculations of radar cross section (RCS), the radar target was a simple missile shape (a cylinder with hemispherical ends). For the measurements, the target was rotated on a turntable from 5 to 365 deg in azimuth, and its RCS was measured with a W-band frequency agile instrumentation radar. (Clutter and noise in the measured RCS data were reduced by spatial filtering.) For modeling the target geometry, the ACAD (advanced computer aided design) geometric modeling program was used to create both an IGES (initial graphics exchange specification) and a facet model. For modeling the RCS, three high frequency prediction codes were used (Xpatch, CADDSCAT, and NcPTD), as well as a point scatter model. Various methods were used to process and simulate the target returns, depending upon the aspect angle. Agreement between the measured and simulated bandwidth averaged RCS values depended on the portion of the target that dominated the radar return: agreement was close for radar returns dominated by returns from the hemispherical ends of the target. However, for aspect angles near broadside to the target (for which the cylindrical part of the target dominated the returns), RCS measurements suggested an interaction between the target and the pylons supporting it.
DTIC
Radar Cross Sections; Synthetic Aperture Radar; Radar Targets

19980038212 Naval Postgraduate School, Monterey, CA USA
The Applications in Military Communications of Low and Medium Earth Orbit Commercial Satellite Systems
Kakavas, Ioannis, Naval Postgraduate School, USA; Sep. 1997; 144p; In English
Report No.(s): AD-A337023; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

At the dawn of the 21st century several Low and Medium Earth Orbit Commercial Satellite constellations will be operational and they will be able to provide high bandwidth Global Communications in voice, data and multimedia services for mobile consumers and also 'users in the move.' This research evolves as a continuation of previous studies (on Iridium, Globalstar, Teledesic and Odyssey), and considers the ICO as well as the Teledesic and GBS systems in an effort to provide a comprehensive model architecture. This model is desired to accommodate the narrow band, wide band and broadcast requirements, respectively, of the U.S. MILSATCOM in addition to the communication needs of a model UN peacekeeping mission. The application of these sys-

tems to U.S. MILSATCOM coincides perfectly with the U.S. defense doctrine of a CONUS-based military with the capability of rapid global power projection to respond to crises throughout the global arena. Instead of investing heavily in new satellite systems, the U.S. military services can use the forthcoming commercial LEOs and MEOs systems to meet the information requirements of tactical commanders.
DTIC
Satellite Communication; Technology Utilization; Defense Program; Mobile Communication Systems

19980038224 Wright Lab., Wright-Patterson AFB, OH USA
Integrated Synthetic Aperture Radar and Navigation Systems for Targeting Applications ***Final Report, 1 Dec. 1992 - 1 Dec. 1993***
Layne, Jeffrey R., Wright Lab., USA; Blasch, Erik P., Wright Lab., USA; Sep. 1997; 53p; In English
Report No.(s): AD-A337532; WL-TR-97-1185; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

High resolution image data produced by a SAR is often employed with a monopulse radar to locate fixed ground based target. However, as with any measuring device, there exists some uncertainty or 'error' in target location. By combining the SAR measurements and monopulse radar measurements with measurements from other sensors, we hope to reduce the level of uncertainty in target location. The goal here is to bring together information from SAR and navigation sensors such as global positioning system (GPS) receiver and/or an inertial navigation system (INS). This report focuses on the integration of measurements from a SAR and an INS in a Kalman filter. Many of the points developed here have been presented in other documents. However, the intent of this document is to bring together some of these ideas to implement SAR measurements in a centralized Kalman filter. The goal is to enhance the overall system accuracy.
DTIC
Synthetic Aperture Radar; Kalman Filters; Inertial Navigation

19980038233 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Speaker Verification in the Presence of Channel Mismatch Using Gaussian Mixture Models
Reid, Robert B., Air Force Inst. of Tech., USA; Dec. 1997; 69p; In English
Report No.(s): AD-A336506; AFIT/GE/ENG/97D-17; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A channel compensation method is sought for use in speaker identification (ID) and verification applications under matched and mismatched training and testing conditions. This work expands on previous work on matched conditions by investigating three techniques on matched and mismatched conditions using the TIMIT and NTIMIT speech databases. First, previous results on 168 speakers are reproduced for matched conditions using Gaussian mixture models (GMM) and mel-frequency cepstral coefficients. Next, cepstral mean subtraction with band limiting (CMSBL) is investigated. The third method, developed in this thesis, uses a modified Wiener filtering approach to channel compensation. New GMMs are created for each method. The first approach is then expanded to include all 630 TIMIT and NTIMIT speakers for speaker verification. For speaker ID under matched conditions, the CMSBL method had three more errors than no additional preprocessing but yielded the best ID results for the mismatch case with 27.4% correct. Additionally, the CMSBL method yielded the best verification results with an equal error rate of approximately 0.26% for matched conditions on TIMIT and approximately 19.6% for mismatched conditions on NTIMIT.
DTIC
Speech Recognition; Models

19980038261 Communications Research Centre, Ottawa, Ontario Canada
Field Trial Evaluation of the CRC Adaptive-Antenna Algorithm for the NATO STANAG 4285 Waveform
Wu, K. H., Communications Research Centre, Canada; Tenne-Sens, A., Communications Research Centre, Canada; Dec. 1997; 48p; In English
Report No.(s): AD-A337942; CRC-RP-97-004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results are presented for the evaluation of an adaptive-antenna algorithm designed for the NATO STANAG 4285 PSK (phase-shift keyed) waveform. The algorithm was developed at the Communications Research Center and has been implemented on both the Andrew SciComm HF Adaptive-Antenna Receiving System (HFAARS or AN/FRQ-26) and the SED Systems Programmable HF Adaptive Receiving System (PHFARS); the tests reported here were conducted using the Andrew HFAARS. The goal was to evaluate the antijamming capability for groundwave or line-of-sight communications in the presence of various types of jamming signals. Performance of the system was characterized in terms of Bit-Error Rate (BER) versus Jamming-to-Signal

ratio (J/S) under various signal, jamming and propagation conditions. Under most of the test conditions reported, the algorithm was able to suppress the jamming signals by at least 40 dB.
DTIC
Evaluation; Antenna Design; Algorithms; Adaptive Filters; Antenna Arrays

19980038266 Naval Postgraduate School, Monterey, CA USA
Integration of Commercial Mobile Satellite Services into Naval Communications
Stone, Cary R., Naval Postgraduate School, USA; Sep. 1997; 167p; In English
Report No.(s): AD-A337021; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Mobile Satellite Services (MSS) need to be integrated into Naval Communications. DoD SATCOM military owned systems fall well short of meeting DoD SATCOM requirements in general and mobile SATCOM specifically. This thesis examines DoD SATCOM requirements, especially those affecting communications on the move. From these requirements, three systems -- Inmarsat, Iridium and Globalstar -- are identified and evaluated for potential use in Naval Communications. An overview of space communications and each of the three systems is provided to identify general operational capabilities, system strengths and system weaknesses. The Naval narrowband functional requirements process is explored and DoD SATCOM and Commercial MSS ability to satisfy those requirements is assessed. Potential Naval MSS communications missions are examined and possible DoD enhancements are considered for each system as well as the impact these enhancements will have on each system. Recommendations are provided as to which Naval communications missions are best suited for these enhanced MSS.
DTIC
Communication Satellites; Satellite Communication; Military Spacecraft; Space Communication

19980038344 Naval Postgraduate School, Monterey, CA USA
Instrumenting the Naval Postgraduate School Global Broadcast Service Testbed Facility
Watkins, John A., Naval Postgraduate School, USA; Jun. 1997; 124p; In English
Report No.(s): AD-A337540; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The work reported in this thesis used readily available components to implement a data acquisition system for a Global Broadcast Service Testbed data collection facility. Use of hardware with controlling software is necessary to collect signal power content of satellite signals at a given distance from the transmitting source. Precise measurement and calibration of a satellite receive signal is accomplished by use of an Hewlett-Packard 8568B spectrum analyzer. A personal computer is used to collect and store retrieved data. These components are brought together using LabVIEW instrumentation software. This system provides an efficient means to collect signal data which can be used to verify satellite link performance estimates. Calculations are performed using Matlab statistical analysis software. This thesis contains calculated and measured values of total average carrier power and background noise levels for the three satellite receive systems that comprise the Naval Postgraduate School Global Broadcast Service Testbed facility.
DTIC
Communication Satellites; Research Facilities; Data Acquisition; Test Stands; Broadcasting

19980038386 Defence Research Establishment Ottawa, Ottawa, Ontario Canada
A System Study of Requirements for SHF/EHF-Terminal Phased-Array Antennas
Felstead, E. B., Defence Research Establishment Ottawa, Canada; Belisle, Claude J., Defence Research Establishment Ottawa, Canada; Morin, Gilbert A., Defence Research Establishment Ottawa, Canada; Nov. 1997; 38p; In English
Contract(s)/Grant(s): Proj. 5CA12
Report No.(s): AD-A338026; CRC-TN-97-007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is much current interest in the use of phased array antennas for military satellite communications terminals. These antennas present definite advantages over conventional dish antennas, such as electronic steering capability, conformal surface potential, and graceful degradation. In view of the potential of phased arrays, CRAD initiated an R&D project, as part of the Military Information and Technology Infrastructure (MITI) thrust, to provide advice on issues such as performance benefits, potential technical improvements, implementation issues, and potential market niche areas. In this report, this process is initiated by generating a set of specifications for the development of such phased array antennas. Five types of terminals are analyzed, namely: EHF manpack, EHF airborne, EHF land transportable, multi-band vehicle mounted, and multi-band shipboard. For the five strawman applications, performance specifications such as EIRP, G/T, etc. are provided.
DTIC
Antenna Arrays; Phased Arrays; Superhigh Frequencies; Satellite Communication; Parabolic Reflectors; Military Technology; Military Spacecraft

19980040039 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

A Comparative Analysis of Networks of Workstations and Massively Parallel Processors for Signal Processing

Gindhart, David C., Air Force Inst. of Tech., USA; Dec. 1997; 151p; In English

Report No.(s): AD-A335181; AFIT/GCE/ENG/97D-01; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The traditional approach to parallel processing has been to use Massively Parallel Processors (MPPs). An alternative design is Commercial-Off-The-Shelf (COTS) workstations connected to high-speed networks. These Networks Of Workstations (NOWs) typically have faster processors, heterogeneous environments, and most importantly, offer a lower per node cost. This thesis compares the performance of MPPs and NOWs for the two-dimensional fast Fourier transform (2-D FFT). Three original, high-performance, portable 2-D FFTs have been implemented: the vector-radix, row-column and pipeline. The performance of these algorithms was measured on the Intel Paragon, IBM SP2 and the AFIT NOW, which consists of 6 Sun Ultra workstations connected via the Myrinet switch. Three important conclusions have been made. First, the pipeline was the best algorithm on all platforms by approximately 30%. Second, the NOW was nearly equal to the SP2 in runtime, while the Paragon did not outperform a single Ultra workstation. As a result, NOWs are a competitive platform for this application. Finally, only limited speedup was achieved on the SP2 (2.9) with 32 processors, and AFIT NOW (1.9) with 5 processors. It appears that the changing communication-to-computation ratio has made the 2-D FFT a less viable candidate for parallelization, given its high communication overhead.

DTIC

Networks; Workstations; Parallel Processing (Computers); Computer Networks; Computer Conferencing

19980040075 Massachusetts Univ., Dept. of Mathematical Sciences, Lowell, MA USA

Application of Radar Analysis to Radar Analysis and Synthesis ***Final Report, 1 Dec. 1994 - 30 Nov. 1997***

Kaiser, Gerald, Massachusetts Univ., USA; Dec. 15, 1997; 9p; In English

Contract(s)/Grant(s): F49620-95-I-0062

Report No.(s): AD-A336761; AFRL-SR-BL-TR-98-0087; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Generalized EM wavelets: These are defined in a conceptually simple way using retarded Green functions. Models for their emission, reflection, and reception have been proposed. The ambiguity function formalism has been generalized to any number of independent transmitting and receiving platforms in arbitrary motion. When specialized to monostatic radar with a single target in uniform motion, this reduces to the usual wideband ambiguity function formalism, which is ordinary time-scale wavelet analysis. (Reduction to the standard time-frequency ambiguity functions is obtained in the well known way to considering the narrowband limit.) The general case is able to handle multiple targets and multiple reflections as well as general motions, being based directly on a physical model using Green functions.

DTIC

Wavelet Analysis; Electromagnetism; Radar

19980040082 Naval Research Lab., Command, Control, Communications, Computers and Intelligence Branch, Washington, DC USA

Reliability Analysis of Networks Carrying Critical Mission Traffic

Lee, Daniel C., Naval Research Lab., USA; Jan. 19, 1998; 11p; In English

Report No.(s): AD-A336880; NRL-MR-8140-98-8129; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report suggests reliability analysis that takes into account the traffic accommodation (the network's ability to carry the required traffic) in the case of component failures. Such analysis is motivated by networks that have predetermined requirements of critical traffic flow such as in military surveillance, data processing, and dissemination. In the course of the discussion, this report suggests computational algorithms that determine whether the network can carry the required traffic. This report also presents new reliability measures that are constructed from the standpoint of network accommodation. Such reliability measures are determined by both the network topology and the traffic demand.

DTIC

Reliability Analysis; Communication Networks; Systems Analysis

19980040088 TRW Systems Integration Group, Systems Engineering and Development Div., Ogden, UT USA

Electromagnetic Systems Effects Database (EMSED): AERO 90, Phase 2, User's Manual, ***31 Dec. 1987 - 1 Jan. 1997***

Sawires, Kalim A., TRW Systems Integration Group, USA; Feb. 01, 1998; 107p; In English

Contract(s)/Grant(s): DNA001-87-C-0274; Proj. RG

Report No.(s): AD-A337992; DNA-TR-92-105; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Electromagnetic Systems Effects Database (EMSED), also called AIRBASE, is a training guide for users not familiar with the AIRBASE database and its operating platform, the Macintosh computer (Mac). The objectives are to efficiently archive EMP test data and provide a useful signal processing and analysis tool for future EMP studies. The first chapter is an introduction to the hardware and software used for this program. This manual will guide the novice through the basics of the Mac operating system in Chapter 2. The use will also acquire knowledge in the basics of the AIRBASE database, and learn how to search, retrieve, and analyze data. A basic tutorial of 4th DIMENSION is included in Chapter 3, and MATLAB starter is provided in Chapter 4. The complete structure and contents of AIRBASE are discussed in Chapter 5. The AIRBASE database was developed under a commercial product called 4th DIMENSION to minimize development and update costs, while retaining the power of a fully relational database architecture.
DTIC
Electromagnetic Pulses; Data Bases; Computer Programs; Relational Data Bases; User Manuals (Computer Programs)

19980040933 Army Research Inst. for the Behavioral and Social Sciences, Fort Knox, KY USA
Tactical Communications Research and Development Requirements from Signal and Behavioral Science Perspectives ***Final Report, Mar. 1993 - Apr. 1997***
Finley, Dorothy L., Army Research Inst. for the Behavioral and Social Sciences, USA; Jun. 1997; 45p; In English
Contract(s)/Grant(s): ARI Proj. 20262785A791
Report No.(s): AD-A337680; ARI-1713; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Requirements are described for research on the effects of signal realities on Army warfighters to minimize their frequency of occurrence and adverse impacts. Signal realities are defined as degradation of electronic communications and automation capabilities as can occur during tactical operations under actual dynamic battlefield conditions. This report analyzes the realities and consequences of battlefield communications degradation; Signal Branch roles in combat; warfighter tendencies to overlook signal realities during operations and exclude realistic communications problems from training; and behavioral science literature on this topic. Based on this information, research goals are specified to identify and clarify effects of degraded signal on battle processes and outcomes; how procedures might be modified to avoid, or adjusted to overcome, these effects; interdependent relationships between signal and warfighter tasks when conducting collective missions, and those tasks best accomplished jointly; and how to improve, through training, battlefield tactical operations supported by signal equipment capabilities. Research areas supporting these goals are then discussed. These include specifying the impacts of communications capability on battle processes and outcomes; identifying training requirements; answering related training research questions and concerns; exploring possible changes in soldier functions, duties, and organization; and developing tools to aid digital battlefield performance.
DTIC
Combat; Education; Pulse Communication

19980040955 NERAC, Inc., Tolland, CT USA
Spread Spectrum Communications. (Latest citations from the NTIS Bibliographic Database)
Mar. 1998; In English
Report No.(s): PB98-853419; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche
The bibliography contains citations concerning the techniques, equipment, and applications of spread spectrum communications. Topics include pseudonoise modulation, coding, signal processing, synchronization, and the use of acoustic wave technology. Applications include uses in satellite television, secure communication, multiplex, and multiple access systems.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Spread Spectrum Transmission; Bibliographies

19980040965 NERAC, Inc., Tolland, CT USA
Chirp Radar. (Latest citations from the NTIS Bibliographic Database)
Feb. 1998; In English
Report No.(s): PB98-852684; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the development and studies of signal processing and pulse compression techniques for chirp radar. Applications include microwave and optical radar, meteorological radar, search and tracking radar, and radar altimeters.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Pulse Compression; Signal Processing; Bibliographies; Radar Transmission; Chirp Signals

19980040977 Woods Hole Oceanographic Inst., MA USA
Design and Evaluation of a Directional Antenna for Ocean Buoys
Frye, Daniel, Woods Hole Oceanographic Inst., USA; Doherty, Ken, Woods Hole Oceanographic Inst., USA; Hinton, Al, Woods Hole Oceanographic Inst., USA; Nov. 1997; 68p; In English; Sponsored in part by a Cecil H. and Ida M. Green Technology Innovation Award
Contract(s)/Grant(s): SC95001
Report No.(s): AD-A337591; WHOI-97-16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A system concept has been developed by Vias at, Inc. and Woods Hole Oceanographic Institution for improving the data telemetry bandwidth available on ocean buoys. This concept utilizes existing communications satellites as data relay stations and mechanically steered antenna arrays to achieve increased data rates and improved power efficiency needed for ocean applications. This report describes an initial feasibility and design study to determine if a mechanically steered antenna array can meet the requirements of open ocean buoy applications. To meet the system requirements, an 18-element microstrip antenna (9-element transmit, 9-element receive) was designed and fabricated under subcontract by Seavey Engineering Associates, Inc. It operates in the 4-6 GHz frequency band (C-band) and provides 14 dB of gain. The % power beamwidth is j150 in azimuth and elevation. This antenna design, in conjunction with a simple rotating mount, was used to evaluate the potential of this approach to keep a geostationary satellite in view when mounted on an ocean buoy. The evaluation is based on laboratory measurements using a magnetic compass and a small stepper motor to maintain antenna orientation while the complete assembly was rotated and tilted at speeds similar to what would be expected on an offshore buoy equipped with a stabilizing wind vane.
DTIC
Evaluation; Antenna Design; Antenna Arrays; Directional Antennas; Fabrication; Telemetry

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

19980037415 Department of the Navy, Washington, DC USA
High-Speed Switch for Fast Routing of Data Packets
Garcia, Joseph P., Inventor, Department of the Navy, USA; Sep. 16, 1997; 13p; In English; Supersedes US-Patent-Appl-SN-504196.
Patent Info.: Filed 19 Jul. 1995; US-Patent-Appl-SN-504196; US-Patent-5,668,653
Report No.(s): AD-D018734; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A switching arrangement is disclosed that interconnects a plurality of processors forming a multi-processor computer system. The switching arrangement comprises optical delay lines that cooperates with microwave switching devices to, provide high speed switching of data packets of the Multi-processor computer system. The optical delay lines temporarily store data packets for a sufficient time to allow for the contention resolution circuit to establish priority for any of the data packets that may be competing for a single source. The switching arrangement allows for the servicing of the data packets within a maximum of a few cycles of the clock rate of the computer system and a minimum of less than one clock cycle.
DTIC
Optical Switching; Packet Switching; Computer Conferencing

19980037833 Aveiro Univ., Aveiro, Portugal
Nineteenth International Conference of Defects in Semiconductors
Jan. 23, 1998; 376p; In English, 21-25 Jul. 1997, USA
Contract(s)/Grant(s): F61708-97-W-0091
Report No.(s): AD-A337844; EOARD-CSP-97-1035; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche

Emphasis will be given on the properties of wide-bandgap materials, including quantum enhancement of effective bandgaps, semiconductors (silicon and III-V materials), plus radiation effects on detector materials. Topics will also include: GaN. Nanostructures, Large bandgap materials, defects in epitaxial growth, selforganizing rare earth, metastable defects, pairs and complexes, defect reactions, radiation effects on detector material.
DTIC
Epitaxy; Conferences; Semiconductors (Materials); Crystal Defects

19980038157 AeroVironment, Inc., Monrovia, CA USA
Development of a Woven-Grid Quasi-BiPolar Battery ***Final Report, 1 Jul. - 31 Dec. 1997***
Tokumaru, P., AeroVironment, Inc., USA; Rippel, W., AeroVironment, Inc., USA; Zambrano, T., AeroVironment, Inc., USA; Jan. 15, 1998; 50p; In English
Contract(s)/Grant(s): NAS3-97164
Report No.(s): AD-A335278; NASA/CR-1998-207822; NAS 1.26:207822; AV-AS100060; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes an analytical and experimental investigation of AeroVironment's Quasi-Bipolar battery concept. The modeling battery design part of the study demonstrates that there is a trade-off between thermal and specified electrical performance. Even so, quasi-bipolar batteries can be designed, with ten times better thermal uniformity, that meet or exceed current state of the art hybrid electric vehicle battery pack performance, even using the same active materials. The thermal uniformity, power, and energy for these quasi-bipolar battery packs is projected to be very good. The experimental part of the investigation demonstrates the concept of the quasi-bipolar plate applied to a lead foil current collector wrapping around two sides of an inexpensive plastic film core. Approximately 50 quasi-biplate samples were fabricated using a hot laminating press. Hot lamination with texture between the plastic and lead shows some promise as a low cost method for fabricating the plates. Five of these plates were assembled into two cells plus one two cell battery. Data from these test cells were compared with existing data for similar true bipolar batteries. The positive side of the plates exhibited corrosion where not protected by the active material.
DTIC
Fabrication; Bipolarity; Electric Batteries; Product Development; Data Acquisition; Numerical Analysis; Lead Acid Batteries; Performance Tests

19980038163 NASA Langley Research Center, Hampton, VA USA
Increased Efficiency LED
Egalon, Claudio O., Inventor, NASA Langley Research Center, USA; Rogowski, Robert S., Inventor, NASA Langley Research Center, USA; Jan. 06, 1998; 13p; In English
Patent Info.: Filed 23 Apr. 1996; NASA-Case-LAR-15184-1-SB; US-Patent-5,705,834; US-Patent-Appl-SN-644654; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

In an LED a large portion of the light produced is lost due to total internal reflection at the air-semiconductor interface. A reverse taper of the semiconductor is used to change the angle at which light strikes the interface so that a greater portion of the light is transmitted.
Official Gazette of the U.S. Patent and Trademark Office
Semiconductors (Materials); Tapering

19980038262 Maryland Univ., Inst. for Plasma Research, College Park, MD USA
22nd International Conference on Infrared and Millimeter Waves ***Final Report, 1 Apr. - 31 Dec. 1997***
Granatstein,, Maryland Univ., USA; Jul. 1997; 426p; In English, 20-25 Jul. 1997, Wintergreen, VA, USA
Contract(s)/Grant(s): F49620-97-I-0226; AF Proj. 2301
Report No.(s): AD-A337918; AFRL-SR-BL-TR-98-0209; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

The conference will cover progress in all areas of infrared and millimeter waves, including the following topics, with special emphasis on new fields of research. (1) Sources: lasers, free electron lasers, gyrotrons, synchrotrons, frequency mixing, calibration and standards. (2) Detectors: receivers, mixers, amplifiers, thermal and photon detectors, Schottky diodes, Josephson and SIS devices, imaging arrays, FET amplifiers. (3) Guided propagation and components: waveguides and other structures, Gaussian beams, integrated devices, optical fibres. (4) Spectroscopic techniques: interferometric, laser and heterodyne spectroscopy. Spectroscopy of solids, liquids and gases. (5) Astronomy and atmospheric physics: techniques, results and interpretation. Applications

in biology and medicine. Plasma interactions and diagnostics. Technical and industrial applications: imaging, remote sensing, non-destructive testing.
DTIC
Conferences; Infrared Radiation; Millimeter Waves

19980038269 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Micro-Electromechanical Switches for Micro-Satellite Power Transfer
Kading, Glen A ., Air Force Inst. of Tech., USA; Dec. 1997; 108p; In English
Report No.(s): AD-A336740; AFIT/GCS/ENG/97D-11; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In the past few years, MicroElectroMechanical Systems (MEMS) have emerged as a promising new technology with tremendous application potential. One of the possible implementations of MEMS technology is in the development of micro-satellites. It should be possible to mass-produce micro-satellites at a fraction of the cost of one conventional satellite. In order for satellites to be robust, a method of transferring power to systems must be addressed. As micro-satellites are made with conventional integrated circuit technologies at a very small scale, a means of transferring power on a similar scale will be investigated. This research addresses the issue of the design, fabrication, and testing of a MEMS switch for space based micro-satellites. Devices are designed and submitted to the Microelectronics Corporation of North Carolina for fabrication. Several different design approaches are attempted, including those using electrostatic and thermal properties for actuation. Fabricated devices are tested using a micro-probe station for power usage, power transfer, and frequency characteristics. Devices produce a wide range of results, the best of which transfer large amounts of power in a wide range of frequencies including DC. Recommendations are made to the sponsor agency including the most appropriate designs for use in micro-satellite applications.
DTIC
Electromechanics; Switches; Technologies; Artificial Satellites; Fabrication; Electromechanical Devices

19980040073 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
Self Assembly of Microstructures
Kladitis, Paul E., Air Force Inst. of Tech., USA; Dec. 1997; 193p; In English
Report No.(s): AD-A336753; AFIT/GE/ENG-97D-02; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Four areas are investigated in this research: erecting microstructures normal to the substrate plane without direct human intervention (self assembled), providing low resistance electrical connections to the erected microstructure, realizing circular motion normal to the substrate plane, and implementing a micro-robot. The designs in this research concentrate on erecting and providing power to a leg designed for use with the micro-robot. The leg and the attached low resistance electrical connectors were not self assembled because the accompanying actuators were not powerful enough. However, the novel connectors provide the most practical, versatile, and lowest possible resistance connections for the MUMPs fabrication process. The micro-robot was a 1 cm by 1 cm by 0.125 mm thick silicon chip with 96 legs micro-machined on one side. The legs were able to support the weight of the chip but could not move the chip. The gold wires used to remotely power the legs, restricted the chip's movement. The chip was turned over, and used as a micro-position to transport a 1 cm by 1 cm by 0.023 mm piece of kapton film A vertically deflecting actuator was used to bump the edge of a 222 mm diameter wheel, causing circular motion normal to the substrate.
DTIC
Microelectronics; Microstructure

19980040087 Virginia Univ., Charlottesville, VA USA
A Survey of Fault Simulation, Fault Grading and Test Pattern Generation Techniques with Emphasis on the Feasibility of VHDL Based Fault Simulation ***Interim Report, Sep 1995 - Apr. 1997***
Johnson, Barry W., Virginia Univ., USA; Smith, D. T., Virginia Univ., USA; DeLong, Todd A., Virginia Univ., USA; Oct. 1997; 130p; In English
Contract(s)/Grant(s): F30602-95-C-0220; AF Proj. 2338
Report No.(s): AD-A337952; RL-TR-97-110; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The primary purpose of this report is to determine the state-of-the-art for fault simulators which are used to estimate the test coverage for the Device Under Test (DUT). It is envisioned that the state-of-the-art survey will be used to assist in defining the fault simulation techniques which are applicable to Verified by the Hardware Description Language (VHDL) models. The goal is to fully understand the current fault simulation state-of-the-art so that existing techniques can be used to assist in the design of a VHDL-based fault simulation tool. One attribute which defines a VHDL-based simulator is that a VHDL compliant simulator is used to simulate the faulty device. Hierarchical serial fault simulation and hierarchical concurrent fault simulation are two techniques which can be used to develop a VHDL-based fault simulator. The state-of-the-art for fault grading techniques along with

an overview of Test Pattern Generation (TPG) methods is also provided in this report. While fault simulation is the main focus of this report, fault grading and TPG are included to completely describe the test generation, fault simulation, and fault grading process. It is important to realize that fault simulation is a means to assist TPG and estimate fault coverage via fault grading. The desired goal for a tool set is to contain a fault simulation technique which seamlessly augments the TPG process and performs fault grading in an efficient fashion.
DTIC
Surveys; Computerized Simulation; Integrated Circuits; Evaluation; Performance Tests

19980040967 National Inst. of Standards and Technology, Gaithersburg, MD USA
NIST Measurement Assurance Program for Resistance
Boynton, P. A., National Inst. of Standards and Technology, USA; Sims, J. E., National Inst. of Standards and Technology, USA; Dziuba, R. F., National Inst. of Standards and Technology, USA; Nov. 1997; In English
Report No.(s): PB98-122062; NIST/TN-1424; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The National Institute of Standards and Technology (NIST) offers resistance Measurement Assurance Program (MAP) transfer at the 1 ohms and 10 kohms levels, to provide a method of assessing and maintaining the quality of a customer's measurement process. This document describes the basic concepts of a resistance MAP, and the procedures for participating in the program. A discussion of the data analysis follows, with an explanation of the uncertainty of the estimate of the transfer. Also included is a sample MAP scenario, with data sheets, analysis results, and a final test report.
NTIS
Electrical Resistance; Electrical Measurement; Qualitative Analysis

19980041207 Department of the Navy, Washington, DC USA
Interband Lateral Resonant Tunneling Transistor
Meyer, Jerry R., Inventor, Department of the Navy, USA; Hoffman, Craig A., Inventor, Department of the Navy, USA; Bartoli, Filber t J., Jr., Inventor, Department of the Navy, USA; Aug. 05, 1997; 11p; In English
Patent Info.: Filed 14 Nov. 1994; US-Patent-Appl-SN-338842; US-Patent-5,654,558
Report No.(s): AD-D018749; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This invention describes a nanometer scale interbank lateral resonant tunneling transistor, and the method for producing the same with lateral geometry, good fanout properties and suitable for incorporation into large scale integration circuits. The transistor is of a single gate design and operation is based on resonant tunneling processes in narrow gap nanostructures which are highly responsive to quantum phenomena. Such quantum effect devices can have very high density operate at much higher temperatures and are capable of driving other devices.
DTIC
Resonant Tunneling; Transistors; Inventions; Nanostructures (Devices)

19980041213 NERAC, Inc., Tolland, CT USA
Reluctance Motors. (Latest citations from the INSPEC Database)
Feb. 1998; In English
Report No.(s): PB98-852718; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the developments and performance of reluctance motors. Topics include performance parameters, operating characteristics, design parameters, technological reviews, control devices, and the use of mathematical models for performance prediction. Materials considerations, applications, and comparisons with other induction motors are also treated. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Induction Motors; Bibliographies

34
FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

19980037424 Maryland Univ., Inst. for Systems Research, College Park, MD USA
Active Control of Surge and Stall in Axial Flow Compressors ***Final Report, 1 Mar. 1993 - 15 Jun. 1996***
Abed, Eyad, Maryland Univ., USA; Dec. 16, 1996; 11p; In English
Contract(s)/Grant(s): F49620-93-I-0186
Report No.(s): AD-A335732; AFRL-SR-BL-TR-98-0115; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Research was conducted in five main areas: (1) Nonlinear Dynamics of Compression Systems; (2) Synthesis of Robust Nonlinear Controllers; (3) Global Stability Analysis of Controllers; (4) Modeling Enhancements; and (5) Modal Participation and Instability Precursors. Results are described in the report along with the bibliography of published papers resulting from this grant.
DTIC
Turbocompressors; Active Control; Stability Tests

19980037429 Department of the Navy, Washington, DC USA
Portable Acoustic Turbulence Detector
Medeiros, Diane, Inventor, Department of the Navy, USA; Oeschger, John, Inventor, Department of the Navy, USA; Hebda, Peter R., Inventor, Department of the Navy, USA; Sep. 09, 1997; 6p; In English; Supersedes US-Patent-Appl-SN-605233, AD-D018017.
Patent Info.: Filed 2 Feb. 1996; US-Patent-Appl-SN-605233; US-Patent-5,666,327
Report No.(s): AD-D018733; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The present invention relates to a system for studying, identifying and characterizing thermal gradients within a volume of water. The system includes a frame formed from a plurality of PVC tubing sections and connectors. The connectors are used to house at least one pair of acoustic transducers, which transducers are used to collect data for studying, identifying and characterizing the terminal gradients within the volume of water. A number of different frame configurations may be used to perform a number of different studies.
DTIC
Electroacoustic Transducers; Portable Equipment; Sound Detecting and Ranging

19980037585 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Assessment of Underwater Blast Effects on Scaled, Submerged Cylindrical Objects
Chung, Michael, Defence Science and Technology Organisation, Australia; Brett, John, Defence Science and Technology Organisation, Australia; Sep. 1997; 33p; In English
Report No.(s): AD-A335032; AR-010-327; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The underwater detonation of large explosive charges close by a target, produce effects that are devastating to vessels such as ships and submarines and in addition, provide a means to neutralise threat sea mines. The roles of the underwater shock wave, flow and bubble in the damage process are not as yet, clear. We present results of an experimental study visualizing the effects of underwater explosions on scaled, submerged cylindrical objects that represent submarines and sea-mines. Significant structural damage to the cylinder occurred with the passage of the shock wave. During this period, the bubble of detonation products failed to expand sufficiently to contact the cylinder. Some evidence is available to suggest that the principal damage mechanism can be attributed to shock wave interaction and not water flow effects. Cavitation was created by the response of the cylinder to the shock wave and by the reflection of the shock wave from the bubble.
DTIC
Underwater Explosions; Cylindrical Bodies; Combustion Products; Explosions; Water Flow; Damage; Cavitation Flow; Shock Wave Interaction; Detonation

19980037598 NASA Johnson Space Center, Houston, TX USA
Method and Apparatus for Measuring Fluid Flow
Arndt, G. Dickey, Inventor, NASA Johnson Space Center, USA; Nguyen, Thanh X., Inventor, NASA Johnson Space Center, USA; Carl, James R., Inventor, NASA Johnson Space Center, USA; Oct. 07, 1997; 25p; In English
Patent Info.: Filed 14 Sep. 1995; NASA-Case-MSC-22366-1; US-Patent-5,675,259; US-Patent-Appl-SN-528069; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Method and apparatus for making measurements on fluids related to their complex permeability are disclosed. A microwave probe is provided for exposure to the fluids. The probe can be non-intrusive or can also be positioned at the location where measurements are to be made. The impedance of the probe is determined. in part. by the complex dielectric constant of the fluids at the probe. A radio frequency signal is transmitted to the probe and the reflected signal is phase and amplitude detected at a rapid rate for the purpose of identifying the fluids. Multiple probes may be selectively positioned to monitor the behavior of the fluids including their flow rate. Fluids may be identified as between two or more different fluids as well as multiple phases of the same fluid based on differences between their complex permittivities.
Official Gazette of the U.S. Patent and Trademark Office
Fluid Flow; Technologies; Nonintrusive Measurement; Flow Measurement; Flow Velocity

19980037677 California Inst. of Tech., Dept. of Aeronautics, Pasadena, CA USA
The Interaction of Shear Flows Generated by a Surface-Piercing Splitter Plate w/Free Surface ***Final Report, 1 Oct. 1993 - 14 Sep. 1996***
Gharib, Mory, California Inst. of Tech., USA; Valluri, Sid, California Inst. of Tech., USA; Roshko, Anatol, California Inst. of Tech., USA; Nov. 26, 1997; 79p; In English
Contract(s)/Grant(s): N00014-93-I-1137
Report No.(s): AD-A335279; Rept-63436; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
An experimental study is performed in a water tunnel (Re = 40,000 to Re = 60,000) to study the interaction between the wake of a circular disk and the free surface. The deformation of the free surface is correlated with the behavior of the wake by utilizing surface pictures, wake flow visualization, drag measurement and Digital Particle Image Velocimetry techniques. It is observed that the wake can exist in two modes with different stabilities. The flow can switch between these two modes and the switching process exhibits hysteresis. The topological differences between these modes and their relation to the observed surface patterns are discussed. The changes in the wake are reflected by an increase in Cd which reaches a maximum value when the upper edge of the disk is 0.125 diameters from the surface. Comparison is also made with a disk approaching a solid boundary.
DTIC
Water Tunnel Tests; Velocity Measurement; Shear Flow; Wakes; Drag Measurement; Computational Fluid Dynamics

19980037936 Army Research Lab., Adelphi, MD USA
A New Model for Turbulence Spectra and Correlations Based on Meijer's G-Functions ***Final Report, Nov. 1997 - Jan. 1998***
Wilson, D. Keith, Army Research Lab., USA; Feb. 1998; 26p; In English
Report No.(s): AD-A337870; ARL-TN-104; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A three parameter model for turbulence spectra and correlation functions, based on Meijer's G functions, is introduced. The model is more flexible than the traditional von Karman model, but still allows the spectra and correlation functions to be derived analytically. The G functions model reduces to the von Karman model for certain combinations of the parameters.
DTIC
Computational Fluid Dynamics; Transcendental Functions; Turbulent Flow

19980038072 NASA Langley Research Center, Hampton, VA USA
Direct Harmonic Linear Navier-Stokes Methods for Efficient Simulation of Wave Packets
Streett, C. L., NASA Langley Research Center, USA; 1998; 14p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-207320; NAS 1.15:207320; AIAA Paper 98-0784; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Wave packets produced by localized disturbances play an important role in transition in three-dimensional boundary layers, such as that on a swept wing. Starting with the receptivity process, we show the effects of wave-space energy distribution on the development of packets and other three-dimensional disturbance patterns. Nonlinearity in the receptivity process is specifically addressed, including demonstration of an effect which can enhance receptivity of traveling crossflow disturbances. An efficient spatial numerical simulation method is allowing most of the simulations presented to be carried out on a workstation.
Author
Navier-Stokes Equation; Wave Packets; Computerized Simulation; Three Dimensional Boundary Layer; Harmonic Functions; Aerodynamics

19980038235 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Experimental Investigation of the Influence of Molecular Weight on Mixing and Penetration in Supersonic Dissimilar Gaseous Injection into a Supersonic Cross-Flow

Giese, Troy A., Air Force Inst. of Tech., USA; Dec. 1997; 53p; In English

Report No.(s): AD-A337155; AFIT/GAE/ENY/97D-03; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In pursuit of a more efficient and effective fuel-air mixing for a SCRAMjet combustor, this study investigated relative near field effects of molecular weight on mixing and penetration of different gaseous injection into a supersonic (M=2.9) cross flow. Helium and argon gas were chosen as injectants because of the large differences in molecular weights. Also, mixing enhancement was observed by injecting the traverse gas jet parallel to the compression face of a ramp. Color schlieren photography was used to identify the shock structures and interactions in the flow field. Measurements of mean flow properties were used to establish the jet plume size, penetration, and concentration and to quantify the total pressure loss. Results indicate greater mixing and plume expansion can be achieved with helium compared to argon.

DTIC

Experimentation; Molecular Weight; Penetration; Mixing; Supersonic Combustion Ramjet Engines; Supersonic Jet Flow; Injection

19980038252 North Carolina State Univ., Dept. of Mechanical and Aerospace Engineering, Raleigh, NC USA

Time Accurate Computation of Unsteady Hypersonic Inlet Flows with a Dynamic Flow Adaptive Mesh ***Final Report, 15 Apr. 1994 - 14 Nov. 1997***

McRae, D. S., North Carolina State Univ., USA; Neaves, Michael, North Carolina State Univ., USA; Jan. 13, 1998; 38p; In English

Contract(s)/Grant(s): F49620-94-I-0237

Report No.(s): AD-A336232; AFRL-SR-BL-TR-98-0091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Completed research is reported for an dynamic numerical investigation of unsteady flow in supersonic and hypersonic aircraft inlets. A n explicit dynamic solution adaptive mesh computational code was further developed and used to obtain dynamic solutions for an axisymmetric mixed compression inlet and a generic dual mode scramjet inlet isolator diffuser combination. to improve robustness, an existing implicit code was modified for time accuracy and the solution adaptive mesh algorithm was installed. The inlet unstart phenomenon was simulated through perturbation of freestream and downstream conditions (axisymmetric inlet) and through downstream throttling for the dual mode 3-D configuration. Axisymmetric unstart could be induced by a 10% freestream temperature increase or a 5% backpressure increase. Comparison of the results with experiment, where available, indicate that stability margins assessed through inviscid design or quasi-steady experiment may need revision when dynamics are considered. Conclusions are drawn concerning specifics of the flow phenomena and directions for future research are suggested. Lack of highly resolved dynamic experimental data is a pacing item and will prevent full verification of future work.

DTIC

Computation; Accuracy; Unsteady Flow; Hypersonic Inlets; Computational Fluid Dynamics

19980038254 Central Inst. of Aviation Motors, Moscow, Russia

Problem of Supersonic Flow Declaration by Magnetic Field ***Final Report***

Vatazhin, Alexander B., Central Inst. of Aviation Motors, Russia; Kopchenov, V. I., Central Inst. of Aviation Motors, Russia; Gouskov, O. V., Central Inst. of Aviation Motors, Russia; Likhter, V. A., Central Inst. of Aviation Motors, Russia; Kholshchevikova, E. K., Central Inst. of Aviation Motors, Russia; Jan. 1997; 34p; In English

Contract(s)/Grant(s): F61708-96-W0297

Report No.(s): AD-A336189; SPC-96-4091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Central Institute of Aviation Motors as follows: The contractor will investigate the problem of hypersonic flow control by magnetic field in channels with minimal losses.

DTIC

Flow Distribution; Supersonic Flow; Pneumatic Control

19980039333 City Coll. of the City Univ. of New York, NY USA

Studies of Shock Wave Interactions with Homogeneous and Isotropic Turbulence ***Final Report***

Briassulis, G., City Coll. of the City Univ. of New York, USA; Agui, J., City Coll. of the City Univ. of New York, USA; Watkins,

C. B., City Coll. of the City Univ. of New York, USA; Andreopoulos, Y., City Coll. of the City Univ. of New York, USA; Mar. 1998; 56p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-1590; RTOP 282-10-01-01
Report No.(s): NASA/CR-1998-206948; NAS 1.26:206948; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A nearly homogeneous nearly isotropic compressible turbulent flow interacting with a normal shock wave has been studied experimentally in a large shock tube facility. Spatial resolution of the order of 8 Kolmogorov viscous length scales was achieved in the measurements of turbulence. A variety of turbulence generating grids provide a wide range of turbulence scales. Integral length scales were found to substantially decrease through the interaction with the shock wave in all investigated cases with flow Mach numbers ranging from 0.3 to 0.7 and shock Mach numbers from 1.2 to 1.6. The outcome of the interaction depends strongly on the state of compressibility of the incoming turbulence. The length scales in the lateral direction are amplified at small Mach numbers and attenuated at large Mach numbers. Even at large Mach numbers amplification of lateral length scales has been observed in the case of fine grids. In addition to the interaction with the shock the present work has documented substantial compressibility effects in the incoming homogeneous and isotropic turbulent flow. The decay of Mach number fluctuations was found to follow a power law similar to that describing the decay of incompressible isotropic turbulence. It was found that the decay coefficient and the decay exponent decrease with increasing Mach number while the virtual origin increases with increasing Mach number. A mechanism possibly responsible for these effects appears to be the inherently low growth rate of compressible shear layers emanating from the cylindrical rods of the grid.
Author
Shock Wave Interaction; Isotropic Turbulence; Homogeneous Turbulence; Turbulent Flow; Compressible Flow; Mach Number

19980040090 Department of the Navy, Washington, DC USA
Bladder Assembly for Retaining Fluid Under Pressure
Moody, Paul E., Inventor, Department of the Navy, USA; Jul. 08, 1997; 8p; In English
Patent Info.: Filed 17 Jan. 1996; US-Patent-Appl-SN-587412; US-Patent-5,645,006
Report No.(s): AD-D018722; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A bladder assembly for retaining and discharging a fluid under pressure Includes a first expandable elastomeric bladder member having a first annularly-shaped base end for anchoring to a foundation and defining a first fixed end, and a first dome-shaped wall portion upstanding from the first fixed end and defining a first movable end. The assembly further includes a second expandable elastomeric bladder member disposed within and contiguous to the first bladder member, and having a second annularly-shaped base end for anchoring to the foundation and defining a second fixed end, and a second dome-shaped wall portion upstanding from the second fixed end and defining a second movable end. The first and second bladder members and the foundation are joined by fitting the first and second base ends to the foundation.
DTIC
Bladder; Urology; Fluid Pressure; Design Analysis; Fabrication

19980041215 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Explicit Integration Schemes for the Hyperbolized Navier-Stokes Equations ***Final Report, 1 Jul. 1995 - 31 Dec. 1996***
vanLeer, Bram, Michigan Univ., USA; Roe, Philip L., Michigan Univ., USA; Mar. 27, 1997; 7p; In English
Contract(s)/Grant(s): F49620-93-I-0417
Report No.(s): AD-A337873; AFRL-SR-BL-TR-98-0202; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Robust and accurate schemes for various 1-D hyperbolized dissipative systems with stiff source terms were developed and tested with success. A Euler preconditioning matrix that maintains the largest possible angle between the eigenvectors of the preconditioned system for the entire Mach number range, was developed in order to prevent the observed stagnation point instability, and tested with success. A Navier Stokes preconditioning matrix that restrains stable and effective for all Mach numbers and Reynolds numbers was developed and tested with success.
DTIC
Computational Fluid Dynamics; Navier-Stokes Equation; Mach Number; Reynolds Number

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Aircraft Instrumentation, and 19 Space Instrumentation.

19980037601 SRI International Corp., Applied Physical Sciences Lab., Menlo Park, CA USA
DC-8 Scanning Lidar Characterization of Aircraft Contrails and Cirrus Clouds ***Final Report***
Uthe, Edward E., SRI International Corp., USA; Nielsen, Norman B., SRI International Corp., USA; Oseberg, Terje E., SRI International Corp., USA; Mar. 04, 1998; 70p; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC2-885; SRI Proj. 6555
Report No.(s): NASA/CR-1998-207544; NAS 1.26:207544; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An angular-scanning large-aperture (36 cm) backscatter lidar was developed and deployed on the NASA DC-8 research aircraft as part of the SUCCESS (Subsonic Aircraft: Contrail and Cloud Effects Special Study) program. The lidar viewing direction could be scanned continuously during aircraft flight from vertically upward to forward to vertically downward, or the viewing could be at fixed angles. Real-time pictorial displays generated from the lidar signatures were broadcast on the DC-8 video network and used to locate clouds and contrails above, ahead of, and below the DC-8 to depict their spatial structure and to help select DC-8 altitudes for achieving optimum sampling by onboard in situ sensors. Several lidar receiver systems and real-time data displays were evaluated to help extend in situ data into vertical dimensions and to help establish possible lidar configurations and applications on future missions. Digital lidar signatures were recorded on 8 mm Exabyte tape and generated real-time displays were recorded on 8mm video tape. The digital records were transcribed in a common format to compact disks to facilitate data analysis and delivery to SUCCESS participants. Data selected from the real-time display video recordings were processed for publication-quality displays incorporating several standard lidar data corrections. Data examples are presented that illustrate: (1) correlation with particulate, gas, and radiometric measurements made by onboard sensors, (2) discrimination and identification between contrails observed by onboard sensors, (3) high-altitude (13 km) scattering layer that exhibits greatly enhanced vertical backscatter relative to off-vertical backscatter, and (4) mapping of vertical distributions of individual precipitating ice crystals and their capture by cloud layers. An angular scan plotting program was developed that accounts for DC-8 pitch and velocity. Author

Scanners; Optical Radar; Product Development; Real Time Operation; Graphic Arts; Display Devices; Cirrus Clouds

19980037709 Finnish Geodetic Inst., Kirkkonummi, Finland
The GWR T020 Superconducting Gravimeter 1994-1996 at the Metsahovi Station, Finland
Virtanen, Heikki, Finnish Geodetic Inst., Finland; Kaariainen, Jussi, Finnish Geodetic Inst., Finland; 1997; ISSN 0355-1962; 32p; In English
Report No.(s): FGI-97-4; ISBN 951-711-208-4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Gravity recording with the Finnish Geodetic Institute's GWR T020 superconducting gravimeter started at the Metsahovi station in August 1994. The experience gained between installation and the end of 1996 are discussed and results from free oscillation of the Earth to Chandler wobble reviewed. The processing of the data is described in detail and the values of the high precision tidal parameters for 44 waves are presented. The polar tide is also clearly discernible. The correlations between residuals and environmental effects such as the level of groundwater measured, precipitation and frequency dependency of atmospheric admittance are discussed. Results of the influence of seismic events and some examples of the ability to study free oscillations of the Earth with this instrument are also given in this report.
Author

Gravimeters; Gravitation; Data Acquisition; Oscillations

19980037710 Finnish Geodetic Inst., Kirkkonummi, Finland
Automated Calibration of Precise Levelling Rods in Finland
Takalo, Mikko, Finnish Geodetic Inst., Finland; 1997; ISSN 0355-1962; 20p; In English
Report No.(s): FGI-97-3; ISBN 951-711-207-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A totally automated vertical laser rod comparator was constructed at the new laboratory of the Finnish Geodetic Institute in 1996. The comparator uses a COHU CCD-camera with an area sensor for determining the position of the rod marks to an accuracy of 0.5 micron, the new HP Laser Interferometer 5527A as a length-standard and a stepping motor to move the rod on the linear

conveyor. The QLI50 data collector measures weather parameters (temperature, humidity and pressure) automatically to correct the laser interferometer measurements. The Pentium PC coordinates all hardware and subprocesses of the automated rod calibration.
Author
Laser Applications; Calibrating; Rods; Temperature Measurement

19980038054 NASA Langley Research Center, Hampton, VA USA
Apparatus and Method for Determining the Mass Density of a Filament
Hinkley, Jeffrey A., Inventor, NASA Langley Research Center, USA; Marchello, Joseph M., Inventor, NASA Langley Research Center, USA; Dec. 09, 1997; 15p; In English
Patent Info.: Filed 29 Sep. 1994; NASA-Case-LAR-14879-1; US-Patent-5,694,807; US-Patent-Appl-SN-316708; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A method and apparatus for determining the mass density of a moving filament is provided. The method includes the steps of providing a filament across two supports, tensioning the filament. inducing a vibration into the filament segment between the supports, reinforcing the vibration using an amplified feedback signal, detecting the vibrational frequency data. processing the data using a fast-fourier transform analysis. and then displaying the frequency. The use of the feedback signal results in a self-tuning resonant loop. Open loop versions may also be used. The apparatus includes a base supporting a fixed support and a transducer which in turn supports a moveable support. The transducer vibrates the moveable support transversely to the direction of travel of the filament, thereby inducing a transverse vibrational mode. The output of the transducer is amplified and used to drive a second amplifier to produce a self-tuning resonant loop. In the open loop version a signal generator is used to drive the transducer through a frequency range, during which the amplitude peak is identified.
Official Gazette of the U.S. Patent and Trademark Office
Density (Mass/Volume); Technologies; Frequency Ranges; Carbon Fibers

19980038162 NASA Marshall Space Flight Center, Huntsville, AL USA
Dual Brushless Resolver Rate Sensor
Howard, David E., Inventor, NASA Marshall Space Flight Center, USA; Jul. 01, 1997; 8p; In English
Patent Info.: Filed 8 Mar. 1996; NASA-Case-MFS-28793-1-GE; US-Patent-5,644,224; US-Patent-Appl-SN-613803; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A resolver rate sensor is disclosed in which dual brushless resolvers are mechanically coupled to the same output shaft. Diverse inputs are provided to each resolver by providing the first resolver with a DC input and the second resolver with an AC sinusoidal input. A trigonometric identity in which the sum of the squares of the sin and cosine components equal one is used to advantage in providing a sensor of increased accuracy. The first resolver may have a fixed or variable DC input to permit dynamic adjustment of resolver sensitivity thus permitting a wide range of coverage. In one embodiment of the invention the outputs of the first resolver are directly inputted into two separate multipliers and the outputs of the second resolver are inputted into the two separate multipliers, after being demodulated in a pair of demodulator circuits. The multiplied signals are then added in an adder circuit to provide a directional sensitive output. In another embodiment the outputs from the first resolver is modulated in separate modulator circuits and the output from the modulator circuits are used to excite the second resolver. The outputs from the second resolver are demodulated in separate demodulator circuit and added in an adder circuit to provide a direction sensitive rate output.
Author
Shafts (Machine Elements); Multipliers; Modulators; Inventions; Patents; Demodulators; Alternating Current; Brushes (Electrical Contacts)

19980038213 TRW Space and Electronics Group, Redondo Beach, CA USA
Fine Collimator Grids Using Silicon Metering Structure ***Final Report, 1 Mar. 1995 - 1 Mar. 1998***
Eberhard, Carol, TRW Space and Electronics Group, USA; Mar. 16, 1998; 25p; In English
Contract(s)/Grant(s): NAGw-4144
Report No.(s): NASA/CR-1998-207498; NAS 1.26:207498; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project Fine Collimator Grids Using Silicon Metering Structure was managed by Dr. Carol Eberhard of the Electromagnetic Systems & Technology Department (Space & Technology Division) of TRW who also wrote this final report. The KOH chemical etching of the silicon wafers was primarily done by Dr. Simon Prussin of the Electrical Engineering Department of UCLA at the laboratory on campus. Moshe Sergant of the Superconductor Electronics Technology Department (Electronics Systems & Technology Division) of TRW and Dr. Prussin were instrumental in developing the low temperature silicon etching processes. Moshe Sergant and George G. Pinneo of the Microelectronics Production Department (Electronics Systems & Technology

Division) of TRW were instrumental in developing the processes for filling the slots etched in the silicon wafers with metal-filled materials. Their work was carried out in the laboratories at the Space Park facility. Moshe Sergant is also responsible for the impressive array of Scanning Electron Microscope images with which the various processes were monitored. Many others also contributed their time and expertise to the project. I wish to thank them all.
Derived from text
Aerospace Engineering; Superconductors (Materials); Microelectronics; Electrical Engineering; Scanning Electron Microscopy; Low Temperature; Collimators

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LASERS AND MASERS

Includes parametric amplifiers. For related information see also 76 Solid-State Physics.

19980037425 Emory Univ., Atlanta, GA USA
Energy Transfer Processes in Iodine Lasers ***Final Report, 01 Nov. 1994 - 31 Oct. 1997***
Heaven, Michael C., Emory Univ., USA; Dec. 28, 1997; 32p; In English
Contract(s)/Grant(s): F49620-95-I-0010; AF Proj. 2303
Report No.(s): AD-A335731; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The near resonant electronic energy transfer process I(2P3/2) + O2(alpha) left & right arrow I(2P1/2) + O2(X) is of central importance in COIL systems. The low temperature kinetics were characterized by studies of I(2P1/2)+O2 quenching at temperatures near 150K. As a component of this effort, sensitive LIF detection of I(2P1/2) was demonstrated. A quenching rate constant of (4.5+/-0.5)x10(exp -12 cu cm /s was obtained, which was appreciably smaller than the values used in current computer models. Ab initio calculations for I+O2 show that transfer is mediated by potential energy surface crossings that occur at short-range. Vibrational relaxation of I2(X) influences the efficiency of COIL systems. Ro-vibrational relaxation rate constants were measured for a range of collision partners (He, Ar, N2, O2, Cl2, I2, H2O). Overall, the inelastic collision dynamics were consistent with the predictions of classical trajectory models. Vibrational relaxation at low temperatures (<20K)wasexa jet expansion. Energy transfer from NCl(alpha) to 12 was examined. Although quenching of NCl(alpha) was near gas kinetic, preliminary results suggest that E-V transfer is inefficient. Abinito calculations for Cl3, attempts to detect bound trihalogen intermediates, and new spectroscopic data for the D'-A' system of Br2 are described.
DTIC
Computerized Simulation; Energy Transfer; Inelastic Collisions; Iodine Lasers; Molecular Relaxation; Potential Energy; Reaction Kinetics

19980037676 University of Central Florida, Center for Research in Electro-Optics and Lasers, Orlando, FL USA
Numerical Modeling of the Laser Pulse Propagation Through the Optical Media With Instantaneous and Accumulative Nonlinearities
VanStryland, Eric, University of Central Florida, USA; Hagan, David, University of Central Florida, USA; Kovsh, Dmitriy, University of Central Florida, USA; Yang, Sidney, University of Central Florida, USA; Dec. 27, 1997; 17p; In English
Contract(s)/Grant(s): N00014-97-I-0936
Report No.(s): AD-A335284; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We are modeling the propagation of high intensity laser pulses through nonlinear optical materials including interactions of two-photon absorption, excited-state absorption and nonlinear refraction including thermal refraction. We have developed a preliminary code written in C++ applicable to Pentium-based PC's that is currently running and being tested against known results over a large range of input parameters. In particular, this code is being used to model optical limiting devices for sensor protection applications. While agreement is excellent for most nonlinearities at relatively low input energies, at high inputs, where transmittance values can drop to low levels, deviations are observed. It is thought that acoustic effects arising from thermal transients may be responsible. This is currently under investigation. We have recently developed an approximate solution for these photoacoustic nonlinearities that is computationally much faster than our previous code which was so computationally intensive that practical problems were prohibitive. This code is now being tested to verify its range of validity.
DTIC
Mathematical Models; Pulsed Lasers; Propagation (Extension); Nonlinearity; Laser Beams

19980038160 University of Southern California, Los Angeles, CA USA

Ultralow Threshold Microlasers ***Final Report, 1 Jul. 1996 - 31 Oct. 1997***

Levi, A. F., University of Southern California, USA; Dapkus, P. D., University of Southern California, USA; Oct. 1997; 20p; In English

Contract(s)/Grant(s): F49620-96-I-0357; AF Proj. 2305

Report No.(s): AD-A336389; AFRL-SR-BL-TR-98-0130; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This final technical report summarizes advances to push the limits of ultralow threshold microlaser VCSEL design implementation, and performance. The main results are summarized: (1) Values of spontaneous emission coupling factor B(beta) in the range between 10(exp -2) and 10(exp -1) lead to comparatively low turn-on delay for both on-on and on-off modulation. Spontaneous emission factors lying between 10(exp -2) and 10(exp -1) are more attractive than devices with B approx. 1, (2) With reduction of aperture size to less than 5 x 5 sq micrometers. the internal quantum efficiency decreases owing to carrier losses resulting from current spreading and carrier out-diffusion, the round-trip loss increases due to excess diffraction and scattering losses, (3) Modal noise and speckle visibility in Gb/s multimode waveguide interconnect systems depends on a complex interplay of carrier dynamics, spontaneous emission factor, gain compression, and device dimensions. Scaled low-power microlasers exhibit modal noise comparable to large incoherent multimode devices, and (4) The series resistance of microlasers has been explored by fabricating low resistance, low-threshold current, and intracavity-contacted devices.

DTIC

Losses; Design Analysis; Performance Tests; Threshold Currents; Fabrication

19980038227 University of Central Florida, Center for Research in Electro-optics and Lasers, Orlando, FL USA

Optical Clock Recovery Using Modelocked Semiconductor Diode Lasers ***Final Report, Sep. 1996 - Mar. 1997***

Oct. 1997; 24p; In English

Contract(s)/Grant(s): F30602-96-2-0200; AF Proj. 4600

Report No.(s): AD-A337170; RL-TR-97-159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ultrahigh speed photonic networks require accurate methods of synchronization in order to provide control signals for switching, routing and demultiplexing. This final report describes work which utilizes external cavity passively niodelocked semiconductor lasers as all optical clock recovery oscillators. It is demonstrated that these lasers can be used to extract and generate accurate timing signals synchronized to an incoming data signal. The results show that minimum injection powers of a few microwatts can be employed for accurate clock recovery.

DTIC

Optical Properties; Clocks; Laser Mode Locking; Semiconductor Lasers; Time Signals

19980038333 Slovak Academy of Sciences, Hurbanova, Czechoslovakia

Supersonic Chemical Oxygen-Iodine Laser Driven by Jet Singlet Oxygen Generator ***Final Report***

Kodymova, Jarmila, Slovak Academy of Sciences, Czechoslovakia; Jan. 31, 1998; 29p; In English

Contract(s)/Grant(s): F61708-96-W0208

Report No.(s): AD-A338024; EOARD-SPC-96-4055; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Institute of Physics Academy of Sciences as follows: The contractor will design and construct a jet singlet oxygen generator appropriate for a supersonic Chemical Oxygen Iodine Laser (COIL). Characterize the generator by measuring the O2 concentration, the residual chorine concentration and the water vapor concentration. The flow parameters of the jet will also be measured. Investigate generator reliability and optimize the system parameters. Upgrade the pumping system to the point where it will handle a supersonic COIL.

DTIC

Laser Beams; Oxygen; Iodine Lasers; Chemical Oxygen-Iodine Lasers; Supersonic Flow; Gas Generators

19980038383 Naval Postgraduate School, Monterey, CA USA

Interaction of Laser Beams with Relativistic Electrons

Small, Douglas W., Naval Postgraduate School, USA; Mar. 1997; 112p; In English

Report No.(s): AD-A337553; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Motivated by the desire to put a Free Electron Laser (FEL) weapon on a ship, the FEL and the related process of Compton backscattering are studied. The theme of the majority of this work is the interaction of the Gaussian optical mode with a beam of relativistic electrons. Classical FEL theory is reviewed in Chapter II. Simulations based on the classical theory are used in Chapter III to study a proposed I kW (kilowatt) infrared FEL. In Chapter IV, simulation is used to study the problem of electron beam/optical mode overlap in an ultraviolet (UV) FEL. A new concept, the FEL with a short Rayleigh length, is sttidied in Chapter V. The

idea is tested on the UV FEL, then used to design and simulate a megawatt-class FEL for ship self-defense. An analytical calculation of the Compton backscattering of laser light is performed in Chapter VI. A quantum electrodynamics (QED) formalism is used to find the spectrum and angular distribution of photons scattertd out of a Gaussian optical mode by relativistic electrons.
DTIC
Electron Beams; Beam Interactions; Free Electron Lasers; Angular Distribution

19980039763 Ohio Wesleyan Univ., Delaware, DE USA
Laser Irradiation Effects: A Functional Assessment ***Final Report, 30 Sep. 1992 - 31 Jul. 1997***
Robbins, David O., Ohio Wesleyan Univ., USA; Aug. 1997; 54p; In English
Contract(s)/Grant(s): DAMD17-92-C-2096
Report No.(s): AD-A337852; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Laser damage criteria have traditionally relied on fundoscopic and/or histological evidence. These methodologies have provided limited information regarding the functional impact of observed damage and more importantly, cannot assess the transition zone between temporary and permanent visual loss. Previously we have shown that transient and permanent visual deficits can be produced by long (msec) duration laser pulses at or slightly below traditional threshold levels for retinal The present investigation extended these exposures to include Q-switched, 532 mn Nd/YAG pulses presented to awake, task-oriented nonhuman primates. At and above the ED50, single pulses of minimal spot diameter (50 % produced only minor, transient shifts in acuity although repeated exposures lead to permanent deficits over time. At lower energies (lOX below ED50), minimal spot, single-pulsed exposures produced little observable consequence until either retinal spot sizes or the number of pulses were increased. At these lower energy levels, however, no permanent functions loss was observed. Hence, the functional impact of singlensec pulses was more difficult to assess than longer msec exposures. Multiple nsec pulses and/or larger spot sizes produced visual deficits similar to those observed for msec exposures, suggesting both - temporal and spatial summation at energy levels where no permanent effects have been noted.
DTIC
Laser Damage; Irradiation; Visual Acuity; Energy Levels; Observation

19980041211 NERAC, Inc., Tolland, CT USA
Excimer Laser Ablation. (Latest citations from the INSPEC Database)
Feb. 1998; In English
Report No.(s): PB98-852809; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the development and evaluation of excimer lasers for use in industrial and medical ablation. Citations discuss manufacturing and analysis of high temperature superconducting, semiconductor, ferroelectric, and polymer thin films. Applications are considered, including surface treatment, metallization, integrated circuit manufacture, surgery, and angioplasty.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Excimer Lasers; Laser Ablation; Bibliographies

37
MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

19980037236 Department of the Navy, Washington, DC USA
Releasable Connector with Severable Line
Hennings, Elsa J., Inventor, Department of the Navy, USA; Herr, Michael D., Inventor, Department of the Navy, USA; Martin, William A., Inventor, Department of the Navy, USA; Sep. 09, 1997; 8p; In English; Supersedes US-Patent-Appl-SN-716666.
Patent Info.: Filed 29 Aug. 1996; US-Patent-Appl-SN-716666; US-Patent-5,664,897
Report No.(s): AD-D018744; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A releasable connector for a pair of tensioned elements, such as straps supporting a parachuted load, has a cylindrical body separable at a diametrical plane into a pair of blocks each adapted for connection of the block to one of the elements. A helical groove is disposed about the body and is wound in one circumferential direction with the majority of an endless line of para-aramid fiber. The line is tensioned to hold the blocks in engagement so that the elements are joined by the connector. The ends of the groove return helically in the opposite circumferential direction, and the remainder of the line is wrapped in this opposite direction about

the majority of the line. The body has a pair of recesses extending radially inwardly from the groove and individually receiving a pair of pyrotechnic line cutters. Each cutter extends into the groove and, at the groove, has an eye through which the line extends for severing by either cutter to release the blocks from engagement and disconnect the tensioned elements.
DTIC
Connectors; Parachutes; Loads (Forces); Releasing

19980037596 Department of the Navy, Washington, DC USA
Variable Shape Control Fin Assembly for Water Vehicles
Cipolla, Jeffrey L., Inventor, Department of the Navy, USA; Aug. 26, 1997; 10p; In English
Patent Info.: Filed 22 Apr. 1996; US-Patent-Appl-SN-641134; US-Patent-5,661,259
Report No.(s): AD-D018687; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A control fin assembly for a water vehicle includes a multiplicity of fins connected together and grouped in an array mounted on the vehicle. A portion of the array is of a shape memory material responsive to heat to assume selected shapes different from the shape of the array portion otherwise. The array portion is electrically conductive and adapted to increase in temperature upon application of electrical current thereto to effect the assumption of the selected shapes. The invention further relates to a control fin for a water vehicle, at least a portion of the fin being of a shape memory material responsive to heat to assume selected shapes different from the shape of the fin otherwise, the fin portion being electrically conductive and adapted to increase in temperature upon application of electrical current thereto to effect the assumption of the selected shapes.
DTIC
Fins; Control Surfaces; Underwater Vehicles; Shape Control; Water Vehicles

19980037704 NASA Johnson Space Center, Houston, TX USA
Axial Pump
Bozeman, Richard J., Jr., Inventor, NASA Johnson Space Center, USA; Akkerman, James W., Inventor, NASA Johnson Space Center, USA; Aber, Gregory S., Inventor, NASA Johnson Space Center, USA; VanDamm, George Arthur, Inventor, NASA Johnson Space Center, USA; Bacak, James W., Inventor, NASA Johnson Space Center, USA; Svejkovsky, Paul A., Inventor, NASA Johnson Space Center, USA; Benkowski, Robert J., Inventor, NASA Johnson Space Center, USA; Dec. 02, 1997; 18p; In English; Continuation of US-Patent-Appl-SN-153595, filed 10 Nov. 1993
Patent Info.: Filed 22 May 1996; NASA-Case-MSC-22424-3; US-Patent-5,692,882; US-Patent-Appl-SN-653929; US-Patent-Appl-SN-153595; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A rotary blood pump includes a pump housing for receiving a flow straightener, a rotor mounted on rotor bearings and having an inducer portion and an impeller portion, and a diffuser. The entrance angle, outlet angle, axial and radial clearances of blades associated with the flow straightener, inducer portion, impeller portion and diffuser are optimized to minimize hemolysis while maintaining pump efficiency. The rotor bearing includes a bearing chamber that is filled with cross-linked blood or other bio-compatible material. A back emf integrated circuit regulates rotor operation and a microcomputer may be used to control one or more back emf integrated circuits. A plurality of magnets are disposed in each of a plurality of impeller blades with a small air gap. A stator may be axially adjusted on the pump housing to absorb bearing load and maximize pump efficiency.
Official Gazette of the U.S. Patent and Trademark Office
Blood Pumps; Impellers; Rotors; Diffusers; Axial Flow

19980038221 Southwest Research Inst., Army TARDEC Fuels and Lubricants Research Facility, San Antonio, TX USA
Heavy Fuel Engine Technology Assessment ***Interim Report, Aug. - Dec. 1997***
Palacios, Cynthia F., Southwest Research Inst., USA; Owens, Edwin C., Southwest Research Inst., USA; Wood, Charles D., Southwest Research Inst., USA; Feb. 1998; 48p; In English
Contract(s)/Grant(s): DAAK70-92-C-0059
Report No.(s): AD-A337601; TFLRF-331; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of the Military Single Fuel Forward Logistics concept, all fuel consuming equipment should be able to operate using JP-8. For most engine driven equipment, this necessitates the use of diesel (compression ignition) rather than gasoline (spark ignition) engines. Because of the lower power density of diesel engines, especially small engines, some current fielded equipment, as well as new equipment being developed, are not complying with the Single Fuel Forward directives. The intent of this study was to survey existing state of the art heavy fuel (diesel) engine technology and recommend an approach to DoD for the acquisition of JP-8 capable engines for these applications. Equipment developers and item managers were surveyed to identity vehicles and equipment currently using gasoline engines, or situation in which engine limitations severely compromise developmental objectives. The characteristics of current state of the art diesel engine technology, along with what might be achievable for military

applications, were then compared with these requirements to determine what engine approaches might satisfy the equipment needs. The final recommendation combines the following three steps to satisfy the requirements of the wide range of DoD engine applications: 1) Modify existing diesel engines to meet weight and power specifications to provide 10,000 DoD engines per year; 2 Design a new engine family utilizing commercial technology for most components to provide 33,000 DoD engines per year; 3) Design an engine family of very high power density to provide 1,000 engines per year that can not be produced by the other two steps.
DTIC
Diesel Engines; JP-8 Jet Fuel; Technology Assessment

19980038222 Army Research Lab., Adelphi, MD USA
Turbine Engine Diagnostics (TED): A Practical Application of a Diagnostic Expert System ***Final Report***
Ingham, Holly, Army Research Lab., USA; Helfman, Richard, Army Research Lab., USA; Hanratty, Timothy, Army Research Lab., USA; Dumer, John, Army Research Lab., USA; Baur, Edmund H., Army Research Lab., USA; Jan. 1998; 28p; In English
Report No.(s): AD-A337590; ARL-SR-60; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Turbine Engine Diagnostics (TED) is a diagnostic expert system that aids the M1 Abrams' mechanic in finding and fixing problems in the AGT-1500 turbine engine. TED was designed to provide the apprentice mechanic the ability to diagnose and repair the turbine engine like an expert mechanic. This report discusses the reasoning method used in TED, called the procedural reasoning system (PRS), as well as various design considerations throughout the life of the project. The expert system was designed and built by the U.S. Army Research Laboratory (ARL) and the U.S. Army Ordnance Center and School (USAOC&S). TED has been fielded to both the Active Army and the National Guard.
DTIC
Turbine Engines; Diagnosis; Expert Systems; Maintenance

19980038226 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Department of Mechanical Engineering
Nov. 1997; 70p; In English
Report No.(s): AD-A337440; NPS-09-97-007; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report contains summaries of research projects in the Department of Mechanical Engineering. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts. The Department of Mechanical Engineering's research effort comprises activities in five main areas: the thermal/fluid sciences; solid mechanics and vibration; dynamic systems and controls; material sciences; and total ship systems engineering. Individual programs of relevance of Navy continue to advance the state of knowledge in each of these areas. Results of these research programs are published in student theses, NPS technical reports, in technical papers given at various nation al and international conferences, and are also published in a wide variety of scientific journals. The individual programs associated with each faculty member are described in the following overviews, which correspond with the main discipline areas of the Department.
DTIC
Research Projects; Mechanical Engineering

19980038241 Stanford Univ., Aerospace Robotics Lab., Stanford, CA USA
Strong Autonomy for Physical Domains ***Final Report, 1 Jan. 1994 - 30 Jun. 1997***
Nilsson, Nils, Stanford Univ., USA; Langley, Pat, Stanford Univ., USA; Shapiro, Daniel, Stanford Univ., USA; Aug. 25, 1997; 22p; In English
Contract(s)/Grant(s): F49620-94-I-0118
Report No.(s): AD-A336225; AFRL-SR-BL-TR-98-0095; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A prototype of a strongly autonomous agent has been implemented. This prototype selects its own objectives and its own values. The agent can then calculate expected values, choose courses of action, and measure received reward.
DTIC
Autonomy; Domains; Prototypes; Artificial Intelligence

19980038246 Boston Univ., Dept. of Aerospace and Mechanical Engineering, Boston, MA USA
Motion Planning for Energy Management in Autonomous Vehicles ***Final Report, 1 Sep. 1994 - 31 Aug. 1997***
Baillieul, John, Boston Univ., USA; Oct. 31, 1997; 29p; In English
Contract(s)/Grant(s): F49620-94-I-0414

Report No.(s): AD-A337010; AFRL-SR-BL-TR-98-0140; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report provides a technical overview of research supported under an AASERT (Augmentation Awards for Science and Engineering Research Training) grant administered by the U.S. Air Force Office of Scientific Research. The grant was tied to a parent grant AFOSR-90-0226 and its follow-on F49620-96-1-0059, both of which bear the title 'The Nonlinear Control Theory of Complex Mechanical Systems.' The period of performance of the subject ASSERT grant was September 94 through August 97. Funds from this grant were used to support the PhD thesis research of Geoffrey Howell as stipulated in the original proposal submitted in the Fall of 1993. Mr. Howell is expected to finish his dissertation and all degree requirements this year. The research described in this report (and which will be reported in greater detail in Geoff Howell's dissertation) is concerned with two interrelated themes in the control of super-actuated (or underactuated) mechanical systems: (1) how to control the degrees of freedom which are directly actuated without eliciting undesired behavior in the unactuated degrees of freedom, and (2) how to prescribe motions of the directly actuated degrees of freedom to achieve motion objectives for the degrees of freedom which are not directly controlled.

DTIC

Degrees of Freedom; Complex Systems; Control Theory

19980038350 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA

AASERT-92/Image Compression and Wavelet Generation ***Final Report, 1 Jun. 1993 - 31 May 1996***

Hodges, Dewey H., Georgia Inst. of Tech., USA; Dec. 04, 1996; 2p; In English

Contract(s)/Grant(s): F49620-93-I-0330

Report No.(s): AD-A337454; AFRL-SR-BL-TR-98-0173; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The general research area was to develop shell finite elements for modeling tires. We started with a survey of the literature and the identification of several potential areas in which we could make some contributions. One was the extension of thick laminate theory to include hyper elastic effects. A second was the development of a suitable finite element discretization method for shells undergoing large deformations. The 'drilling' degrees of freedom were judged to be an important aspect of that development, and a separate study was begun on that. A third aspect was dynamic contact modeling. Mr. Maasha surveyed the literature and began to write some code including the drilling degrees of freedom which would have compared the existing formulations. Our intent was to identify which, if any, of the existing formulations for the drilling degrees of freedom we should use. Later, Mr. Warner began work on modeling contact as an intermittent slip/stick problem with frictions.

DTIC

Finite Element Method; Tires

19980040091 Department of the Navy, Washington, DC USA

Adjustable Lifting and Precision Positioning Device

Moody, Paul E., Inventor, Department of the Navy, USA; Oct. 09, 1997; 15p; In English

Patent Info.: US-Patent-Appl-SN-954885

Report No.(s): AD-D018747; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A device for precision lifting and positioning of test pieces is provided. The device has a rigid connector attachment which moves the application point of a vertical lifting force over the center of gravity of a test piece despite having a lifting attachment point at its far edge. The rear to forward adjustment is provided by a screw which moves the application of the lifting force backward and forward along the axis of a rigid connector.

DTIC

Adjusting; Lift; Positioning Devices (Machinery)

19980040957 NERAC, Inc., Tolland, CT USA

Barrier Coatings. (Latest citations from Information Services in Mechanical Engineering Database)

Mar. 1998; In English

Report No.(s): PB98-853476; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning protective coatings for high temperature use in aerospace and non-aerospace applications. Coating methods, applications, and failure analysis of barrier coatings are discussed. Topics include yttria stabilized zirconia coatings, plasma-sprayed coatings, thermal shock and cycling, and durability of barrier coatings. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Protective Coatings; High Temperature Environments

19980040972 Department of the Navy, Washington, DC USA

Underwater Mateable Electrical Connector with Anti-Hydrolock Feature

Marolda, Victor J., Inventor, Department of the Navy, USA; Manstan, Roy, Inventor, Department of the Navy, USA; Jun. 24, 1997; 21p; In English

Patent Info.: US-Patent-Appl-SN-682878

Report No.(s): AD-D018752; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

An electrical connector includes a plug section having a body, and a receptacle section which is connected to the plug section. A collapsible seal is disposed within a circumferential groove formed in the plug section. The receptacle section has a cylindrical housing with a clamping ring for securely engaging and connecting the receptacle section to the plug section. Upon connecting the receptacle section to the plug section any hydrostatic forces present in the chamber between the receptacle section and the plug section causes the collapsible seal to collapse within the groove thereby providing a volume defined by the groove which receives fluid therein for preventing hydrostatic lock.

DTIC

Electric Connectors; Hydrostatics; Hydrostatic Pressure

38
QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

19980037600 NASA Langley Research Center, Hampton, VA USA

Eddy Current Method for Fatigue Testing

Simpson, John W., Inventor, NASA Langley Research Center, USA; Fulton, James P., Inventor, NASA Langley Research Center, USA; Wincheski, Russell A., Inventor, NASA Langley Research Center, USA; Todhunter, Ronald G., Inventor, NASA Langley Research Center, USA; Namkung, Min, Inventor, NASA Langley Research Center, USA; Nath, Shridhar C., Inventor, NASA Langley Research Center, USA; Dec. 16, 1997; 19p; In English; Division of US-Patent-Appl-SN-134444, filed 12 Oct. 1993

Patent Info.: Filed 5 Jun. 1995; NASA-Case-LAR-15046-2; US-Patent-5,698,977; US-Patent-Appl-SN-490441; US-Patent-Appl-SN-134444; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Flux-focusing electromagnetic sensor using a ferromagnetic flux-focusing lens simplifies inspections and increases detectability of fatigue cracks and material loss in high conductivity material. A ferrous shield isolates a high-turn pick-up coil from an excitation coil. Use of the magnetic shield produces a null voltage output across the receiving coil in presence of an unflawed sample. Redistribution of the current flow in the sample caused by the presence of flaws. eliminates the shielding condition and a large output voltage is produced, yielding a clear unambiguous flaw signal. Maximum sensor output is obtained when positioned symmetrically above the crack. by obtaining position of maximum sensor output, it is possible to track the fault and locate the area surrounding its tip. Accuracy of tip location is enhanced by two unique features of the sensor; a very high signal-to-noise ratio of the probe's output resulting in an extremely smooth signal peak across the fault, and a rapidly decaying sensor output outside a small area surrounding the crack tip enabling the search region to be clearly defined. Under low frequency operation, material thinning due to corrosion causes incomplete shielding of the pick-up coil. Low frequency output voltage of the probe is therefore a direct indicator of thickness of the test sample. Fatigue testing a conductive material is accomplished by applying load to the material, applying current to the sensor, scanning the material with the sensor, monitoring the sensor output signal, adjusting material load based on the sensor output signal of the sensor, and adjusting position of the sensor based on its output signal.

Official Gazette of the U.S. Patent and Trademark Office

Eddy Currents; Fatigue Tests; Crack Tips; Defects; Microwave Sensors

19980037708 Alabama Univ., Center for Automation and Robotics, Huntsville, AL USA

Study Methods to Standardize Thermography NDE *Final Report No. 4*

Walker, James L., Alabama Univ., USA; Workman, Gary L., Alabama Univ., USA; Feb. 1998; 79p; In English

Contract(s)/Grant(s): NAS8-38609

Report No.(s): NASA/CR-1998-207358; NAS 1.26:207358; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this work is to develop thermographic inspection methods and standards for use in evaluating structural composites and aerospace hardware. Qualification techniques and calibration methods are investigated to standardize the thermographic method for use in the field. Along with the inspections of test standards structural hardware, support hardware is designed and fabricated to aid in the thermographic process. Also, a standard operating procedure is developed for performing inspections with the Bales Thermal Image Processor (TIP). Inspections are performed on a broad range of structural composites. These materi-

als include various graphite/epoxies, graphite/cyanide-ester, graphite/silicon-carbide, graphite phenolic and Keviar/epoxy. Also metal honeycomb (titanium and aluminum faceplates over an aluminum honeycomb core) structures are investigated. Various structural shapes are investigated and the thickness of the structures vary from as few as 3 plies to as many as 80 plies. Special emphasis is placed on characterizing defects in attachment holes and bondlines, in addition to those resulting from impact damage and the inclusion of foreign matter. Image processing through statistical analysis and digital filtering is investigated to enhance the quality and quantify the NDE thermal images when necessary.
Author
Thermography; Nondestructive Tests; Composite Materials; Standards

19980038340 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Detecting Cracks under Ferrous Fasteners Using the Nortec-30 Eddyscan Fastener Hole Inspection Instrument
Nolan, Richard W., Defence and Civil Inst. of Environmental Medicine, Canada; McRae, Kenneth I., Defence and Civil Inst. of Environmental Medicine, Canada; Mar. 1997; 12p; In English
Report No.(s): AD-A337500; DCIEM-97-TM-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Nortec-30 Eddyscan Fastener Hole Inspection Instrument was used to detect known fatigue cracks under the heads of alloy steel fasteners installed in 0.258 in. diameter countersunk fastener holes drilled through 0.330 in. pieces of 7075-T651 aluminum alloy plate. It was found that magnetic fields caused by prior magnetization in a majority of ferrous fasteners resulted in large numbers of false indications. When nonferrous or non magnetized ferrous fasteners were used, the Nortec-30 was able to reliably detect relatively small flaws in the holes underneath the beads of these fasteners. Since the rotating coil eddy current technique is dependent upon the magnetic condition of the fastener, the Nortec-30 is not recommended for use with ferrous fastening systems.
DTIC
Nondestructive Tests; Cracks; Fault Detection; Fasteners

39
STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

19980037021 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Quantification of Shape, Angularity, and Surface Texture of Base Course Materials
Janoo, Vincent, Army Cold Regions Research and Engineering Lab., USA; Jan. 1998; 29p; In English
Report No.(s): AD-A335673; CRREL-SR-98-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A state-of-the-art review was conducted to determine existing test methods for characterizing the shape, angularity, and surface texture of coarse aggregates. The review found direct methods used by geologists to determine these characteristics. These methods involve physical measurements of individual aggregates and are very laborious and time consuming. Engineers have developed index tests (indirect methods) to quantify the combined effect of the shape, angularity, and surface texture of coarse aggregates in terms of changes in the voids in the aggregate bulk. A description of both the direct and indirect methods is provided in the report. Also, the effect of shape, angularity, and surface texture of coarse aggregates on the base course performance was reviewed. It was found that there is some contradiction in the published data on resilient modulus. Shape, angularity, and surface texture of coarse aggregates clearly influence the angle of internal friction.
DTIC
Aggregates; Dimensional Measurement; Geological Surveys

19980037603 Department of the Navy, Washington, DC USA
Vibration Damping of Structural Products
Macander, Aleksander B., Inventor, Department of the Navy, USA; Tinley, Thomas N., Inventor, Department of the Navy, USA; Chiu, Steven S., Inventor, Department of the Navy, USA; Sep. 30, 1997; 5p; In English; Superseded by US-Patent-Appl-SN-530391, AD-D018474.
Patent Info.: Filed 19 Sep. 1995; US-Patent-Appl-SN--530391; US-Patent-5,672,228
Report No.(s): AD-D018688; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Vibration damping layers are stored as a continuous elongated strap in coiled condition for supply to subsequently fabricated structural products. Such strap is formed from high modulus layer constrainment segments encapsulated within a viscoelastic

material contributing to establishment of tile vibration damping property and flexure of the strap between the segments thereof to accommodate coiling during storage. The strap is uncoiled from its storage condition during a supply phase to a preselected surface of the fabricated structural product.
DTIC
Vibration Damping; Damping; Coils; Viscoelasticity; Composite Materials

19980037837 Virginia Univ., School of Engineering and Applied Science, Charlottesville, VA USA
Material Failure Mechanisms in Nonlinear Solids and Structures ***Final Report, 1 Apr. 1995 - 31 Dec. 1997***
Horgan, Cornelius O., Virginia Univ., USA; Johnson, Wills, Virginia Univ., USA; Feb. 1998; 19p; In English
Contract(s)/Grant(s): F49620-95-I-0308
Report No.(s): AD-A337848; UVA/525816/CE98/102; AFRL-SR-BL-TR-98-0206; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work was concerned with research on the fundamental mechanics and mathematics of material failure mechanisms in nonlinear solids and structures. The specific areas investigated were those of void nucleation and growth due to large deformations in nonlinear solids and end effects in anisotropic and laminated structures. Research on cavitation phenomena, which serve as a precursor to fracture, is crucial to the understanding of failure mechanisms in rubber-like solids (e.g. polymers, solid rocket propellants, aircraft tires) and of ductile fracture processes in metals. In particular, the work is relevant to the tire degradation problems of concern to Air Force scientists at Wright Patterson AFB. Mathematically, the work involved investigation of singular solutions of the second-order quasi linear system of partial differential equations describing equilibrium states of nonlinearly elastic bodies. For radially symmetric deformations, the basic problem reduces to a bifurcation problem for a single second-order nonlinear ordinary differential equation. Particular emphasis was placed on the effect of material inhomogeneity, compressibility and anisotropy on void nucleation and growth, including non-axisymmetric problems.
DTIC
Anisotropy; Compressibility; Nonlinear Equations; Partial Differential Equations

19980038332 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Failure Characteristics of Sandwich Plates Under Static and Dynamic Loading
Palazotto, A. N., Air Force Inst. of Tech., USA; Grummadi, L. N., Air Force Inst. of Tech., USA; Oct. 1997; 254p; In English
Report No.(s): AD-A338022; AFIT/ENY/TR-97-03; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Laminated sandwich plate constructions are extensively used in various aerospace and industrial applications. However, these plates are prone to many defects. Specifically, their resistance to impact is a major concern. Impact can significantly reduce the strength and stiffness of the structure. Studying various aspects that can be used to improve the impact resistance of sandwich plates is the objective of this report. Two different sandwich models are studied. First, the sandwich plate is made of conventional honeycomb construction while the second plate is made of Z-pins. Experiments are conducted and based on the experimental observations, a phenomenological analytical approach is developed. Issues studied include the determination of impact induced damage initiation, types of damage modes, propagation of damage modes, and the effect of damage on the overall performance of the sandwich plates.
DTIC
Failure; Honeycomb Structures; Dynamic Loads; Static Loads; Aerospace Engineering; Sandwich Structures

19980038372 Army Research Lab., Aberdeen Proving Ground, MD USA
Modal Analysis of the Prototype Heavy Composite Hull
Berman, Morris, Army Research Lab., USA; Feb. 1998; 116p; In English
Report No.(s): AD-A338057; ARL-MR-387; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A modal analysis was performed on the Heavy Composite Hull (HCH). The object of this experiment was to provide structural dynamic information to be used to validate a finite element model. The experimental model was also used to update the finite element model, as well as to provide damping information. This report details the analysis performed on the HCH in two configuration. The first configuration utilized excitation by four shakers placed at the comers of the floor. The second configuration also utilized four shakers, but two were placed on the roof in an attempt to excite local modes. The first elastic mode of the HC H was observed at 36.1 Hz (0.425% critical damping). Modes up to 100 Hz were analyzed for this report. This report describes the characteristics of the extracted modes.
DTIC
Finite Element Method; Composite Structures; Experimentation; Mathematical Models; Dynamic Structural Analysis

19980040978 Universal Technology Corp., Dayton, OH USA
High Cycle Fatigue (HCF) Science and Technology Program ***Annual Report, 1 Jan. - 31 Dec. 1997***
Jan. 1998; 89p; In English
Contract(s)/Grant(s): F33615-94-C-5800; AF Proj. 3066
Report No.(s): AD-A337618; AFRL-PR-WP-TM-1998-2002; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This first annual report of the National Turbine Engine High Cycle Fatigue (HCF) Program is a brief review of work completed, work in progress, and technical accomplishments. This program is a coordinated effort with participation by the Army, Navy, Air Force and NASA. The technical efforts are organized under seven Action Teams including: Materials Damage Tolerance Research, Forced Response Prediction,Component Analysis, Instrumentation, Passive Damping Technology, Component Surface Treatments, and Aeromechanical Characterization. Daniel E. Thomson, AFRL/PRTC, Wright-Patterson AFB, is the Program Manager.
DTIC
Aircraft Engines; Tolerances (Mechanics)

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19980037414 NASA Langley Research Center, Hampton, VA USA
The CERES S'COOL Project: Development and Operational Phases
Chambers, Lin H., NASA Langley Research Center, USA; Young, David F., NASA Langley Research Center, USA; Racel, Anne M., NASA Langley Research Center, USA; Seventh Symposium on Education; 1998, pp. 90-93; In English; Symposium on Education, 11-16 Jan. 1998, Phoenix, AZ, USA; Sponsored by American Meteorological Society, USA
Report No.(s): NASA/TM-1998-207569; NAS 1.15:207569; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

As part of NASA's Mission to Planet Earth, the first Clouds and the Earth's Radiant Energy System (CERES) instrument will be launched on the Tropical Rainfall Measuring Mission (TRMM) spacecraft from the Tanegashima launch site in Japan in November 1997. The instrument will measure the radiation budget incoming and outgoing radiant energy - of the Earth. The major feature of interest is clouds, which play a very strong role in regulating our climate. CERES will identify clear and cloudy regions and determine cloud physical and microphysical properties using imager data from a companion instrument. Validation efforts for the remote sensing algorithms will be intensive. As one component of the validation, the S'COOL (Students' Cloud Observations On-Line) project will involve school children around the globe in making ground truth measurements at the time of a CERES overpass. They will report cloud type, height, fraction, and opacity, as well as the local surface conditions. Their observations will be collected at the NASA Langley Distributed Active Archive Center (DAAC) and made available over the Internet for educational purposes as well as for use by the CERES Science Team in validation efforts. Pilot testing of the S'COOL project began in January 1997 with two local schools in Southeastern Virginia and one remote site in Montana. National testing in April 1997 involved 8 schools (grades 3 to high school) across the USA. Global testing will be carried out in October 1997. Details of the S'COOL project, which is mainly Internet-based, are being developed in each of these phases according to feedback received from participants. In 1998, when the CERES instrument is operational, a global observer network should be in place providing useful information to the scientists and learning opportunities to the students. Broad participation in the S'COOL project is planned, both to obtain data from a wide range of geographic areas, and to involve as many students as possible in learning about clouds and atmospheric science. This paper reports on the development phase of the S'COOL project, including the reaction of the teachers and students who have been involved. It describes the operational state of the S'COOL network, and identifies opportunities for additional participants.
Author
Atmospheric Radiation; Radiant Flux Density; Visual Observation; Mission to Planet Earth; Energy Budgets

19980037416 Woods Hole Research Center, MA USA
Land-use in Amazonia and the Cerrado of Brazil: State of Knowledge and GIS Database ***Final Report, 1 Apr. 1996 - 14 Jul. 1998***
Nepstad, Daniel C., Woods Hole Research Center, USA; 1997; 6p; In English
Contract(s)/Grant(s): NAGw-5084; NAG5-5164
Report No.(s): NASA/CR-97-207614; NAS 1.26:207614; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We have assembled datasets to strengthen the LargeScale Biosphere Atmosphere Experiment in Amazonia (LBA). These datasets can now be accessed through the Woods Hole Research Center homepage (www.whrc.org), and will soon be linked to the Pre-LBA homepages of the Brazilian Space Research Institute's Center for Weather and Climate Prediction (Instituto de Pesquisas Espaciais, Centro de Previsao de Tempo e Estudos Climaticos, INPE/CPTEC) and through the Oak Ridge National Laboratory, Distributed Active Archive Center (ORNL/DMC). Some of the datasets that we are making available involved new field research and/or the digitization of data available in Brazilian government agencies. For example, during the grant period we conducted interviews at 1,100 sawmills across Amazonia to determine their production of sawn timber, and their harvest intensities. These data provide the basis for the first quantitative assessment of the area of forest affected each year by selective logging (Nepstad et al, submitted to Nature). We digitized the locations of all of the rural households in the State of Para that have been mapped by the Brazilian malaria combat agency (SUCAM). We also mapped and digitized areas of deforestation in the state of Tocantins, which is comprised largely of savanna (cerrado), an ecosystem that has been routinely excluded from deforestation mapping exercises.
Derived from text
Data Bases; Ecosystems; Weather Forecasting; Deforestation

19980038067 NASA Ames Research Center, Moffett Field, CA USA
Grapevine Remote Sensing Analysis of Phylloxera Early Stress (GRAPES): Remote Sensing Analysis Summary
Lobitz, Brad, Johnson Controls World Services, USA; Johnson, Lee, Johnson Controls World Services, USA; Hlavka, Chris, NASA Ames Research Center, USA; Armstrong, Roy, Johnson Controls World Services, USA; Bell, Cindy, Johnson Controls World Services, USA; Dec. 1997; 28p; In English
Contract(s)/Grant(s): RTOP-233-01-04-05
Report No.(s): NASA-TM-112218; A-09296; NAS 1.15:112218; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
High spatial resolution airborne imagery was acquired in California's Napa Valley in 1993 and 1994 as part of the Grapevine Remote sensing Analysis of Phylloxera Early Stress (GRAPES) project. Investigators from NASA, the University of California, the California State University, and Robert Mondavi Winery examined the application of airborne digital imaging technology to vineyard management, with emphasis on detecting the phylloxera infestation in California vineyards. Because the root louse causes vine stress that leads to grapevine death in three to five years, the infested areas must be replanted with resistant rootstock. Early detection of infestation and changing cultural practices can compensate for vine damage. Vineyard managers need improved information to decide where and when to replant fields or sections of fields to minimize crop financial losses. Annual relative changes in leaf area due to phylloxera infestation were determined by using information obtained from computing Normalized Difference Vegetation Index (NDVI) images. Two other methods of monitoring vineyards through imagery were also investigated: optical sensing of the Red Edge Inflection Point (REIP), and thermal sensing. These did not convey the stress patterns as well as the NDVI imagery and require specialized sensor configurations. NDVI-derived products are recommended for monitoring phylloxera infestations.
Author
Spatial Resolution; Vineyards; Damage; Remote Sensing; Farm Crops; Imaging Techniques

19980038211 Army Engineer Waterways Experiment Station, Coastal Hydraulics Lab., Vicksburg, MS USA
Mouth of the Colorado River, Texas, Monitoring Program *Final Report*
King, David B., Army Engineer Waterways Experiment Station, USA; Prickett, Terri L., Army Engineer Waterways Experiment Station, USA; Jan. 1998; 100p; In English
Report No.(s): AD-A337046; WES/TR/CHL-98-2; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
This report provides an overview of the monitoring effort of the U.S. Army Corps of Engineers at the mouth of the Colorado River, Texas. The report includes background information and objectives of the study, which were as follows: (1) Evaluate the design and efficiency of the weir jetty and adjacent impoundment basin so that project maintenance requirements and costs can be more accurately established; (2) Develop and improve equations for computing long shore sediment transport in the vicinity of the Colorado River, Texas; (3) Determine which sediment transport equations work best in the surf zone; and (4) Collect data to aid in efforts to improve future designs of similar Corps projects. The report also include s data collection plans and procedures, data analysis, an evaluation of the project, and conclusions and recommendations. The data collection effort was divided into three main components: deployment of offshore directional wave sensors to obtain long-term, continuous wave, current, and water level information; intense, short-term field experiments that principally collected sediment transport data in the surge zone; and bathymetry surveys of the adjacent shorelines.
DTIC
Sediment Transport; Colorado River (North America)

19980040942 Naval Research Lab., Oceanography Div., Stennis Space Center, MS USA

Comparison of Model Output of Wind and Wave Parameters with Spaceborne Altimeter Measurements

Hwang, Paul A., Naval Research Lab., USA; Bratos, Steven M., Naval Research Lab., USA; Teague, William J., Naval Research Lab., USA; Wang, David W., Naval Research Lab., USA; Jacobs, Gregg A., Naval Research Lab., USA; Jan. 1998; 11p; In English

Report No.(s): AD-A337734; NRL/PP/7332--97-0025; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One of the major issues in the hindcasting and forecasting of winds and waves is the difficulty of validation and verification. While comparisons with point measurements from discrete and sparsely distributed wave buoys provide some measure of statistical confidence, the spatial distribution of the modeled wind and wave fields cannot be easily assessed. Remote sensing from space provides a synoptic view of the ocean wind and wave fields. For example, wind speed and significant wave height are standard output of spaceborne altimeters such as TOPEX/POSEIDON (hereafter referred to as TOPEX for brevity). Comparisons of the altimeter measured wind speed and wave height with surface buoy data have shown very positive agreement. With an along track resolution of 7 km, the spatial resolution of the spaceborne altimeter is comparable with that of the numerical models used for regional simulations. In the following, we present the results of a comparison study of WAM wave modeling of the Yellow and East China Seas (YES) with two of the TOPEX tracks in the region. In the next section the accuracy of TOPEX altimeter wind and wave measurements is summarized based on earlier studies of TOPEX and surface buoy comparisons. Section 3 describes the YES data sets and the background information about the numerical modeling and satellite tracks in the comparison region. Section 4 presents the results of the comparison in terms of statistics such as bias (B), rms difference (delta), regression coefficient and correlation coefficient (R). Since altimeter remote sensing provides a spatial coverage of the wind and wave fields along transects, we will explore the use of such information for the validation of wave height distribution from a numerical wave model output. The conclusions and summary are presented in the last section of the paper.

DTIC

Ocean Models; Oceanography; Dynamic Models; Water Waves; Air Water Interactions; Forecasting

19980040962 NERAC, Inc., Tolland, CT USA

Water Quality Standards Summaries: State and Federal Criteria. (Latest citations from the NTIS Bibliographic Database)

Feb. 1998; In English

Report No.(s): PB98-852791; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning compilations of water quality standards for the USA and the U.S. territories. Individual chemicals such as mercury, cyanide, arsenic, zinc, organic compounds, pesticides, and iron, as well as bacteria are discussed. Standards for pH, temperature, dissolved solids, dissolved oxygen, and material degradation are included. State water quality standards are included.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Water Quality; Standards; Surface Water; Bibliographies

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

19980040953 Science Applications International Corp., Energy Projects Div., Golden, CO USA

Fabrication and Testing for Solar Detoxification Project ***Final Report, Oct. 1996 - Aug. 1997***

Doty, S., Science Applications International Corp., USA; Widmer, N., Science Applications International Corp., USA; Beninga, K., Science Applications International Corp., USA; Cole, J., Science Applications International Corp., USA; Dec. 1997; 121p; In English, USA

Contract(s)/Grant(s): DACA31-92-D-0057

Report No.(s): AD-A337946; SFIM-AEC-ET-CR-97038; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A demonstration of a solar detoxification system was conducted for the U.S. Army Environmental Center (USAEC) at Science Applications International Corporation's (SAIC's) test site near Golden, Colorado, in June 1997. The purpose of this demonstration test was to evaluate the use of solar energy for thermally detoxifying organic compounds representative of soil contamination found at U.S. Army sites. The demonstration test was carried out under the third of three tasks conducted under

contract by SAIC. Under Tasks I and II, the conceptual and detailed design of a pilot-scale system was completed. Under Task III, fabrication and testing of the system were accomplished. This document presents the results obtained during the Task III demonstration test. The purpose of this demonstration test was to evaluate the use of solar energy to thermally detoxify organic compounds removed from contaminated media by ex situ (such as thermal desorption) or in situ (such as soil vapor extraction) treatment systems, or desorbed from pretreatment matrices (such as activated carbon). Extraction systems are commercially available so the step of directly extracting organic from contaminated soil was excluded from the pilot-scale demonstration. Rather, the pilot-scale demonstration test focused on evaluating UltraViolet (UV)-rich solar destruction of Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) by a solar incinerator and the environmental control of the resulting off gases.
DTIC
Fabrication; Performance Tests; Solar Energy; Solar System

19980041212 NERAC, Inc., Tolland, CT USA
Fuel Cells. (Latest citations from the NTIS Bibliographic Database)
Mar. 1998; In English
Report No.(s): PB98-853401; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the development and utilization of fuel cells for energy production and storage. Topics include system descriptions and evaluation, theoretical aspects, and design and fabrication considerations. Molten carbonate and phosphoric acid fuel cells are among the types considered. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Fuel Cells

45
ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19980037574 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Investigation of Environmental Paradigms and Organizational Classifications
Ee, Marvin T., Air Force Inst. of Tech., USA; Dec. 1997; 171p; In English
Report No.(s): AD-A334405; AFIT/GEE/ENV/97D-05; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The extent of environmental management in organizations is largely determined by what paradigms are espoused with respect to maintaining both natural resources and raw materials. Environmental management paradigms possibly stem from whether an organization is private or public, producing a product or providing a service. However, no established methods exist for comparing organizations with regard to environmental management approaches and perspectives. The purpose of this thesis is to determine whether particular organizational classifications are linked to specific environmental management paradigms. This study incorporates several environmental management concepts to develop an analytical instrument for observing organizations. Environmental management paradigms provide a common spectrum of comparing organizations to one another. Environmental management systems provide a common basis on which to evaluate organizations. Environmental corporate responses identify environmental perspectives. The combination of paradigms, systems, and corporate responses results in the creation of a tool for analyzing organizations. After analyzing ten of each type of organization, it is found that private with product organizations appear to have the highest overall degree of environmental management, followed by the private with service arena and finally the public with service sector. Theoretical reasons for the results include: financial benefits, production control, long term planning, and managerial cohesion.
DTIC
Classifications; Environment Management; Management Systems; Production Management; Management Planning

19980037575 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Development of Activity Based Costing (ABC) Optimization Tool for an Environmental Organization
Gutterman, Anthony J., Air Force Inst. of Tech., USA; Dec. 1997; 167p; In English
Report No.(s): AD-A334398; AFIT/GEE/ENV/97D-08; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of this thesis was to develop a tool that would allow the user the ability to determine the activities an organization should track using Activity Based Costing (ABC). This was accomplished through the assignment of costs to the maintenance of ABC data and the determination of the benefit received as a result of using ABC. While obtaining the information pertinent to the cost of ABC was relatively straightforward and well documented, the information regarding the value of the benefit of ABC was not available. Therefore, using information provided in the literature concerning savings resulting from making the polluter pay for the amount of pollution generated, a benefit ratio was established based on the idea that when an organization is given both the financial ability and responsibility to pay for its actions, savings will immediately occur. Current tools and techniques available in the ABC literature concerning the cost and benefit of ABC focus on the development of cost drivers. Nothing is available which focuses on the activities that should be used by an ABC system. This thesis expands the body of knowledge on ABC by developing such a tool. In addition, nothing currently is available which allows an ABC practitioner the ability to know what value of benefit must be received from ABC in order to recoup the financial investment involved in using such a system. Success stories have been written citing 10 to 100 times the investment gained as a result of using ABC, but this may or not be the case for every organization. This thesis fills the gap between hoping to receive a 10 or 100 times payback and knowing what the expected payback must be in order to use ABC beneficially (in terms of dollars invested).
DTIC
Cost Analysis; Investment; Pollution; Waste Management; Cost Estimates; Financial Management

19980037590 Naval Facilities Engineering Service Center, Port Hueneme, CA USA
Technology Transfer Report: Production Base Catalyzed Decomposition Process Guam, Mariana Islands ***Final Report, Oct. 1992 - Jun. 1997***
Benoit, S. D., Naval Facilities Engineering Service Center, USA; Gallagher, W. E., Naval Facilities Engineering Service Center, USA; Chan, D. B., Naval Facilities Engineering Service Center, USA; Fukumoto, J. L., Naval Facilities Engineering Service Center, USA; Crisostomo, F. Q., Naval Facilities Engineering Service Center, USA; Oct. 1997; 402p; In English
Report No.(s): AD-A335956; NFESC-TR-2075-ENV; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

The first product Base Catalyzed Decomposition Process (BCDP) operated successfully on Guam April 1996 to June 1997. The unit treated 11,700 tons of soil at PCB levels over 2,000 ppm to below 0.05 ppm at rates up to 2 tons per hour. A novel air control system produces a stack gas cleaner that required by hazardous waste incinerators. The Naval Facilities Engineering Service Center managed the development of the unit for the Navy's Pacific Division from the laboratory to a full production system over an 8-year period. Conventional remediation on Guam would have required that the contaminated material be placed in drums and shipped over 6,000 miles to a mainland disposal facility - a very expensive procedure. In finding a solution to this problem, the Navy created a remediation system that is cost-effective on the mainland as well as Guam, and environmentally safe to operate,
DTIC
Technology Transfer; Decomposition; Catalysis; Hazardous Wastes; SOIls

19980037711 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Composite Sampling of Sediments Contaminated with White Phosphorus
Walsh, Marianne E., Army Cold Regions Research and Engineering Lab., USA; Collins, Charles M., Army Cold Regions Research and Engineering Lab., USA; Bailey, Ronald N., Army Cold Regions Research and Engineering Lab., USA; Grant, Clarence L., Army Cold Regions Research and Engineering Lab., USA; Dec. 1997; 26p; In English
Report No.(s): AD-A335137; CRREL-SR-97-30; SFIM-AEC-ET-CR-97043; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

White phosphorus from exploded munitions is a difficult contaminant to characterize in the environment. Spatial heterogeneity of concentration estimates is extreme, varying over many orders of magnitude for closely spaced discrete samples. to provide cost-effective data upon which decisions may be made, two composite sampling methods were designed to aid in characterizing the site and monitoring the remedial process for an area contaminated by white phosphorus. For each method, closely spaced discrete samples were collected on a grid pattern and pooled to form composites. The composites were then divided by size fractions. Mean white phosphorus concentrations were estimated for the fine-grain-size fraction that was obtained by suspension with water. The presence of highly toxic solid white phosphorus particles, the form that may be ingested by feeding waterfowl, was determined in the coarse-grain-size fraction that was obtained by sieving.
DTIC
Composite Materials; Cost Effectiveness; Data Acquisition; Phosphorus

19980038158 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A System Dynamics model of the Bioavailability of Metals in Constructed Wetland Sediment

Wood, Timothy S., Air Force Inst. of Tech., USA; Dec. 1997; 149p; In English

Contract(s)/Grant(s): AFIT/GEE/ENV/97D-23

Report No.(s): AD-A335207; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Constructed wetlands used for storm water treatment accumulate metals primarily in their sediment. This sediment has the potential to produce toxic effects in benthic organisms at some period in time. Bioavailability of metals in sediment is directly linked to pore water metal activity. The mechanisms that influence pore water metal activity are included in physical, chemical, and biological processes. A system dynamics model was developed to represent these processes and the major influences affecting pore water metal activity in a treatment wetland receiving storm water influent. The model structure and behavior was tested and validated using several system dynamics validation techniques. The model was run using the metals Pb, Cu, and Cd. The model indicated that the chemical processes of Acid-Volatile Sulfide (AVS) and organic carbon in binding metal in reduced sediment were the greatest influences in controlling metal bioavailability. The effect of bioturbation, as represented in the model, was negligible. Amount of organic carbon in the sediment seems to play the greatest role in controlling metal bioavailability in the long run. This model provides a platform for guiding future research in sediment toxicology, specifically in treatment wetlands.

DTIC

Dynamic Models; Wetlands; Metals; Chemical Reactions; Activity (Biology); Organic Materials

19980038357 Science and Technology Corp., Hampton, VA USA

Second Tri-Service Environmental Technology Workshop, 'Enhancing Readiness Through Environmental Quality Technology

Bader, Darlene, Science and Technology Corp., USA; Aug. 1997; 464p; In English, 10-12 Jun. 1997, St. Louis, MI, USA

Contract(s)/Grant(s): CACA31-93-D-0062

Report No.(s): AD-A337474; STC-TR-3152; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

The Tri-Service Environmental Technology Workshop was held 1012 June 1997 at the Adam's Mark Hotel. St. Louis, Missouri. This workshop provides a training forum for technical exchange on environmental technology strategies, initiatives, and demonstrations. This document includes 37 papers presented at the workshop, as well as 6 contributed papers.

DTIC

Environment Management; Environmental Quality

19980038358 Idaho Univ., Center for Hazardous Waste Remediation Research, Moscow, ID USA

Physiology, Biochemistry, and Genetics of a Pure Culture of an Obligalory Anaerobic Bacterium That Utilizes 2,4,6-Trinitrotoluene (TNT) ***Final Report, 14 Aug. 1994 - 14 Oct. 1997***

Crawford, Ronald L., Idaho Univ., USA; Crawford, Don L., Idaho Univ., USA; Feb. 04, 1998; 9p; In English

Contract(s)/Grant(s): F49620-94-I-0306; AF Proj. 2312

Report No.(s): AD-A337478; AFRL-SR-BL-TR-98-0164; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This work has contributed to the development of processes for bio remediation of explosives-contaminated soils and waters. We examined the role of micro-bial consortia and pure strains of Clostridium spp. In the bio-degradation of TNT and other nitroaromatic contaminants. C. bifermentans, an anaerobe isolated from an enrichment of munitions-contaminated soil, degraded TNT co-metabolically. We identified reductive TNT transformations that produced triaminotoluene (TAT) and phenolic products of TAT hydrolysis. Since clostridia are common in soils, the addition of fermentable sugars to TNT contaminated soils should stimulate the reactions we observed. Examination of the ability of clostridial strains isolated from a munition enrichment, non-adapted clostridial, and other bacterial strains to degrade TNT indicated that the ability to reduce TNT anaerobically is a general phenomenon and that the TNT degradative pathways are not inducible, but are associated with constitutively expressed metabolic functions of Clostridium spp. We showed that bulk production of clostridial spores is clearly achievable for use in bio-augmentation or bio remediation systems. Overall, our work with anaerobic consortia and with pure cultures derived from the consortia indicates a complex TNT bio-degradation process in soil, which involves multiple organisms acting synergistically and probably sequentially.

DTIC

Anaerobes; Biochemistry; Water Pollution; SOIl Pollution; Aromatic Compounds

19980038924 NASA Langley Research Center, Hampton, VA USA

Distributions of Beryllium 7 and Lead 210, and Soluble Aerosol-Associated Ionic Species Over the Western Pacific: PEM West B, February - March 1994

Dibb, J. E., New Hampshire Univ., USA; Talbot, R. W., New Hampshire Univ., USA; Lefer, B. L., New Hampshire Univ., USA; Scheuer, E., New Hampshire Univ., USA; Gregory, G. L., NASA Langley Research Center, USA; Browell, E. V., NASA Langley Research Center, USA; Bradshaw, J. D., Georgia Inst. of Tech., USA; Sandholm, S. T., Georgia Inst. of Tech., USA; Singh, H. B., NASA Ames Research Center, USA; Journal of Geophysical Research; Dec. 20, 1997; ISSN 0148-0227; Volume 102, No. D23, pp. 28,287-28,302; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-1233

Report No.(s): NASA/CR-97-207351; NAS 1.26:207351; Paper-96JD02981; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Aerosol sampling for the determination of the concentrations of soluble ionic species and the natural radionuclides Be-7 and Pb-210 was conducted from the NASA DC-8 over the western Pacific as part of GTE/PEM-West B during February - March 1994. Concentrations of most soluble ionic species in the free troposphere were higher in samples collected on flights originating from Hong Kong and Japan than those collected further east over the open ocean. In both regions the measured concentrations were higher than those found during PEM-West A (fall 1991). Activities of Pb-210, a tracer of air masses influenced by sources on the Asian continent, showed the same patterns. These data indicate the effect of stronger continental outflow from Asia over the western Pacific during the spring compared to fall season. For readily scavenged aerosol-associated species and soluble acidic gases the strongest indications of Asian outflow were restricted to altitudes below 6 km. The distribution of the continental tracer Pb-210 was also compared to those of a large number of gas phase species measured on the DC-8. Relatively strong correlations were found with O3, and peroxyacetylnitrate (PAN), but only during the flights over the remote Pacific. During PEM-West A, similar correlations were seen, but they were stronger near Asia. We believe that correlations are a signature of continental air that has been processed by deep wet convection over land before being advected over the ocean. One flight over the Sea of Japan provided the opportunity to sample upper troposphere/lower stratosphere air in and around a tropopause fold. Concentrations of Be-7 reached 7 pCi/cu m STP, and peak O3, mixing ratios of 480 ppb were encountered at 10.7 km. The Be-7 data are used to estimate the fraction of stratospheric air mixed down into the troposphere by circulation in the fold.

Author

Beryllium 7; Lead Isotopes; Troposphere; Air Sampling; Aerosols; Air Masses; Trace Elements; Atmospheric Chemistry; Atmospheric Composition; Ions; Atmospheric Circulation; Spatial Distribution; Vertical Distribution

19980038967 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Laboratory Study of Volatile Organic Compound Partitioning, Vapor/Aqueous/SOIl

Hewltt, Alan D., Army Cold Regions Research and Engineering Lab., USA; Feb. 1998; 21p; In English

Report No.(s): AD-A337494; CRREL-SP-98-3; SFIM-AEC-ET-CR-98001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A laboratory experiment measured the concentrations of volatile organic compounds (VOCs) existing in a vapor, water, and bulk soil media after several weeks of exposure to a contaminant source. The experimental design included quiescent conditions, hydrated mineral surfaces, and a constant temperature of 11 +/- 1 deg C. The findings show that similar to Henry's law, fairly constant ratios are likely to exist between soil vapor and bulk soil VOC concentrations. These results are encouraging for those attempting to use active soil gas measurements to predict bulk VOC concentrations in the vadose zone.

DTIC

Organic Compounds; Contaminants; SOIls

19980039765 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

Metabolic Inhibition of a Toluene-Enriched Microbial Population Due to Lead (Pb(2+)); Verification of a Free Metal ION Toxicity Model

Marbas, Patrick J., Air Force Inst. of Tech., USA; Dec. 1997; 109p; In English

Report No.(s): AD-A335197; AFIT/GEE/ENV/97D-18; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A dissolved oxygen probe and an ion specific electrode were used to study the lead-induced metabolic inhibition in a toluene-enriched microbial population. Predicted toxicity values were compared to the actual toxicity responses using a free metal ion Toxicity Model (TM) which linked metabolic inhibition with lead activity. Experimentally derived values for the model parameters (lead activity and a lead distribution coefficient) were used in the TM. It was postulated that cellular metabolism is disrupted by the conformational changes to the cell's plasma membrane produced by lead ion adsorption. The predicted toxicity values were higher than the actual toxicity response. This is expected since the TM did not distinguish between essential and non-essential

cellular ligands. Moreover, lead-induced metabolic inhibition appears to be pH dependent as the TM predicted. An adsorption experiment suggested that the microbial mass has two lead binding sites: tightly bound ligands and loosely bound ligands. The tightly bound ligand sites appeared to be saturable. No evidence of saturation was observed in tile loosely bound ligand sites. Contrary to expectations, the loosely bound ligand sites appear to be more essential to cellular metabolism than the tightly bound ligand sites.
DTIC
Lead (Metal); Metal Ions; Metabolism; Microorganisms; Chemical Bonds; Prevention; Cells (Biology)

19980040044 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
A Modeling Study for the Implementation of In Situ Cometabolic Bioremediation of Trichloroethylene-Contaminated Groundwater
Christ, John A., Air Force Inst. of Tech., USA; Dec. 1997; 128p; In English
Report No.(s): AD-A335202; AFIT/GEE/ENV/97D-03; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The limitations of conventional groundwater remediation technologies have led to the development of innovative technologies which may achieve national hazardous waste site remediation goals. Before an innovative technology can be implemented in the field, remedial project managers, regulators and other stakeholders require adequate modeling tools to help assess the applicability of the technology at a particular site. This modeling study investigates how an innovative technology, in situ cometabolic bioremediation, might be implemented to remediate a TCE-contaminated site, under different site conditions. A steady-state model is developed which couples an analytical expression to simulate the effect of flow between multiple pumping and injection wells, with an expression to calculate TCE removal as groundwater circulates through in situ bioreactors established around the injection wells. Varying site conditions and well configurations are investigated to determine their effect on the overall treatment efficiency of a system. A dual screen well design is found to be an effective method for contaminant capture and treatment given typical values of anisotropy. Investigation of a multiple row implementation concept proves it to be an effective configuration for site cleanup. The model is integrated into interactive software which serves as a technology screening tool.
DTIC
Steady State; Ground Water; Hazardous Wastes; Trichloroethylene; Contamination; Chemical Reactors

19980040095 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
Mobilization of Trace Elements in Aquifers by Biodegradation of Hydrocarbon Contaminants
Kearney, Scott L., Air Force Inst. of Tech., USA; Dec. 1997; 218p; In English
Report No.(s): AD-A335195; AFIT/GEE/ENV/97D-13; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This study had two objectives: (1) to determine the extent of metal mobility within petroleum-contaminated aquifers, (2) to determine if biodegradation of petroleum hydrocarbons can explain metal mobility. The approach reviewed analytical results from 2305 groundwater sampling events, taken from 958 wells, located at 136 sites found at 53 Air Force installations. The study showed that high levels of metals are present at petroleum hydrocarbon sites where metals would not generally be expected. of the metals with drinking water Maximum Contaminant Levels (MCLs), mercury and silver were detected the least frequently. Barium and copper were detected at the sites, but fewer than 2.5 percent of the samples exceeded their MCLs. All other metals exceeded their MCLs in at least 2.5 percent of the samples, with antimony and lead exceeding their MCLs in 19 percent and 10 percent of samples, respectively. Higher concentrations of barium and manganese were most strongly correlated with petroleum hydrocarbon contamination, and relatively strong correlations also existed for aluminum, arsenic, iron, and lead. Major cations such as calcium, magnesium, sodium and potassium were least affected by petroleum hydrocarbons concentrations.
DTIC
Petroleum Products; Biodegradation; Hydrocarbons; Contaminants

19980040958 NERAC, Inc., Tolland, CT USA
Chemical Analysis of Aerosols and Airborne Particulates. (Latest citations from the NTIS Bibliographic Database)
Mar. 1998; In English
Report No.(s): PB98-853468; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning techniques and equipment used in chemical analyses of aerosols and airborne particulates. Citations review spectroscopic, chromatographic, and laser-assisted studies of aerosol and airborne pollutants. Topics include mobile atmospheric pollutants, airborne asbestos, organic aerosol mixtures, toxicologic evaluation of airborne mix-

tures, aerosol characterization, and environmental monitoring. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Aerosols; Bibliographies; Particulates

19980040960 NERAC, Inc., Tolland, CT USA
Bioremediation of Groundwater. (Latest citations from the Energy Science and Technology Database)
Mar. 1998; In English
Report No.(s): PB98-853393; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the biological treatment of contaminated groundwater. Articles address technology for in situ bioremediation as well as biotreatment techniques for pumped or extracted groundwater. Specific pollutants discussed include polycyclic aromatics, munitions wastes, chlorinated organics, petroleum wastes, and volatile organic compounds. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Ground Water; Water Pollution; Water Treatment

19980040961 Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC USA
Risk Management Programs: 40 CFR Part 68
Jan. 1998; 564p; In English
Report No.(s): PB97-963259; EPA/540/R-97/039; OSWER-9285.9-34; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

This manual is for reference use of students enrolled in scheduled training courses of the U.S. Environmental Protection Agency (EPA). While it will be useful to anyone who needs information on the subjects covered, it will have its greatest value as an adjunct to classroom presentations involving discussions among the students and the instructional staff.
NTIS
Risk; Air Pollution; Environment Protection; Safety Management

19980040969 Environmental Protection Agency, Research Triangle Park, NC USA
Estimating the Area of Influence of Ozone Produced by Local Precursor Emissions for a Summer Period with a Range of Photochemical Activity
Tonnesen, G. S., Environmental Protection Agency, USA; Dennis, R. L., Environmental Protection Agency, USA; Gipson, G. L., Environmental Protection Agency, USA; 1998; In English; Joint Conference on the Applications of Air Pollution Meteorology, 11-16 Jan. 1998, Phoenix, AZ, USA; Sponsored by Air and Waste Management Association, USA
Report No.(s): PB98-116312; EPA/600/A-97/097; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

A Federal Advisory Committee Act (FACA) work group is studying the identification of Areas of Influence (AOI's), essentially O3 airsheds, around which to design controls for subregions of the eastern U.S. In this study, we use sensitivity simulations to evaluate the AOI of precursor emissions in selected source regions, and we use a process analysis to explain the results of those sensitivity simulations.
NTIS
Photochemical Reactions; Air Pollution; Ozone

46
GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19980037240 California Univ., Inst. of Tectonics, Santa Cruz, CA USA
Variations in Crust and Upper Mantle Structure Beneath Diverse Geologic Provinces in Asia ***Final Report, 1 Aug. 1994 - 30 Sep. 1997***
Schwartz, Susan Y., California Univ., USA; Dec. 16, 1997; 52p; In English
Contract(s)/Grant(s): F4962-94-I-0050

Report No.(s): AD-A335697; AFRL-SR-BL-TR-98-0098; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents results of a two year effort to determine crust and mantle lithospheric structure beneath Eurasia and to explore the effects that structural variations have on regional wave propagation. First, variations in crust and lid structure on Pn and Lg propagation are investigated using regionalized velocity models previously determined under China. While explosion Pn/Lg ratios are higher than earthquake ratios for all of the regionalized Chinese velocity models, this difference is much smaller than the variations in Pn/Lg ratios caused by propagation differences. This emphasizes the importance of resolving crust and upper mantle structure for successful discrimination. The second part of this report describes detailed regional wave modeling studies to determine crustal and mantle lithospheric structure beneath Tibet. We find low average crustal P-wave velocities (5.9-6.1 km/s), thick crust (68-76 km) and fast lithospheric mantle (8.2-8.25 km/s) beneath the Lhasa Terrane in southern Tibet. Crustal and mantle lithospheric structure to the north in the Qiangtang Terrane differs dramatically with average crustal P and S-wave velocities 4% faster and 2% slower, respectively relative to the Lhasa Terrane. These differences are too large to be explained by temperature differences alone and require a partially molten uppermost mantle lithosphere in the Qiangtang Terrane.

DTIC

Seismic Waves; Earth Mantle; Wave Propagation; P Waves; S Waves; Earthquakes

19980037420 SRI International Corp., Molecular Physics Lab., Menlo Park, CA USA

Atmospherically Related Studies of O(D-1) and O2 (b'Sigma(sub g, sup +) ***Annual Report***

Slanger, Tom G., SRI International Corp., USA; Mar. 1998; 6p; In English

Contract(s)/Grant(s): NAGw-3669; SRI Proj. 4894

Report No.(s): NASA/CR-1998-207539; NAS 1.26:207539; SRI-MP-98-017; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

For the third year of the grant, we propose to investigate the (beta)'(Sigma)(sub g, sup +). Our earlier value of 0.77 +/- 0.23, which has been used for a long time, should be updated, and the error limits reduced. Current measurements in J. Barker's group at the University of Michigan have assigned a value closer to 0.9, and we will conduct a new evaluation. The goals of this project are to investigate various aspects of the photochemistry of O('D) and O2(beta)'(Sigma)(sub g, sup +) that are of relevance to the photochemistry and energy balance of the terrestrial atmosphere. Over the last six months, we have obtained new sky spectra data files from the Keck telescope via Don Osterbrock at UC Santa Cruz, and now 120 hours of data have been accumulated. Thus, we have been able to make large signal/noise improvements of the O2(b'(Sigma)(sub g, sup +) - X(sup 3)(Sigma)(Sub g, sup -) Atmospheric Band data that we are collecting.

Author

Atmospheric Chemistry; Photochemical Reactions; Signal to Noise Ratios

19980037669 Massachusetts Inst. of Tech., Dept. of Earth, Atmospheric and Planetary Sciences, Cambridge, MA USA

Partitioning of Moderately Siderophile Elements Among Olivine, Silicate Melt, and Sulfide Melt: Constraints on Core Formation in the Earth and Mars

Gaetani, Glenn A., Massachusetts Inst. of Tech., USA; Grove, Timothy L., Massachusetts Inst. of Tech., USA; Geochimica et Cosmochimica Acta; 1997; ISSN 0016-7037; Volume 61, No. 9, pp. 1829-1846; In English

Contract(s)/Grant(s): NAGw-3586

Report No.(s): NASA/CR-97-207386; NAS 1.26:207386; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

This study investigates the effects of Variations in the fugacities of oxygen and sulfur on the partitioning of first series transition metals (V, Cr, Mn, Fe, Co, Ni. and Cu) and W among coexisting sulfide melt, silicate melt, and olivine. Experiments were performed at 1 atm pressure, 1350 C, with the fugacities of oxygen and sulfur controlled by mixing CO2, CO, and SO2 gases. Starting compositions consisted of a CaO-MgO-Al2O3-SiO2-FeO-Na2O analog for a barred olivine chondrule from an ordinary chondrite and a synthetic komatiite. The f(sub O2)/f(sub S2), conditions ranged from log of f(sub O2) = -7.9 to - 10.6, with log of f(sub S2) values ranging from - 1.0 to -2.5. Our experimental results demonstrate that the f(sub O2)/f(sub S2) dependencies of sulfide melt/silicate melt partition coefficients for the first series transition metals arc proportional to their valence states. The f(sub O2)/f(sub S2) dependencies for the partitioning of Fe, Co, Ni, and Cu are weaker than predicted on the basis of their valence states. Variations in conditions have no significant effect on olivine/melt partitioning other than those resulting from f(sub O2)-induced changes in the valence state of a given element. The strong f(sub O2)/f(sub S2) dependence for the olivine/silicate melt partitioning of V is attributable to a change of valence state, from 4+ to 3+, with decreasing f(sub O2). Our experimentally determined partition coefficients are used to develop models for the segregation of sulfide and metal from the silicate portion of the early Earth and the Shergottite parent body (Mars). We find that the influence of S is not sufficient to explain the overabundance of siderophile and chalcophile elements that remained in the mantle of the Earth following core formation. Important constraints

on core formation in Mars are provided by our experimental determination of the partitioning of Cu between silicate and sulfide melts. When combined with existing estimates for siderophile element abundances in the Martian mantle and a mass balance constraint from Fe, the experiments allow a determination of the mass of the Martian core (approx. 17 to 22 wt% of the planet) and its S content (approx.0.4 wt%). These modeling results indicate that Mars is depleted in S, and that its core is solid. Author

Olivine; Silicates; Sulfides; Oxygen; Transition Metals; Planetary Mantles; Planetary Structure; Melts (Crystal Growth)

19980037689 Texas Univ., William B. Hanson Center for Space Sciences, Dallas, TX USA

Equatorial Density Irregularity Structures at Intermediate Scales and Their Temporal Evolution

Kil, Hyosub, Texas Univ., USA; Heelis, R. A., Texas Univ., USA; Journal of Geophysical Research; Mar. 01, 1998; ISSN 0148-0227; Volume 103, No. A3, pp. 3969-3981; In English

Contract(s)/Grant(s): NAGw-4492; NSF ATM-96-15064

Report No.(s): NASA/CR-1998-207750; NAS 1.26:207750; Paper- 97JA03344; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

We examine high resolution measurements of ion density in the equatorial ionosphere from the AE-E satellite during the years 1977-1981. Structure over spatial scales from 18 km to 200 m is characterized by the spectrum of irregularities at larger and smaller scales and at altitudes above 350 km and below 300 km. In the low-altitude region, only small amplitude large-scale (lambda greater than 5 km) density modulations are often observed, and thus the power spectrum of these density structures exhibits a steep spectral slope at kilometer scales. In the high-altitude region, sinusoidal density fluctuations, characterized by enhanced power near 1-km scale, are frequently observed during 2000-0200 LT. However, such fluctuations are confined to regions at the edges of larger bubble structures where the average background density is high. Small amplitude irregularity structures, observed at early local time hours, grow rapidly to high-intensity structures in about 90 min. Fully developed structures, which are observed at late local time hours, decay very slowly producing only-small differences in spectral characteristics even 4 hours later. The local time evolution of irregularity structure is investigated by using average statistics for low-(1% less than sigma less than 5%) and high-intensity (sigma greater than 10%) structures. At lower altitudes, little chance in the spectral slope is seen as a function of local time, while at higher attitudes the growth and maintenance of structures near 1 km scales dramatically affects the spectral slope. Author

Ion Density (Concentration); High Resolution; Examination; Irregularities

19980038194 Boston Univ., Boston, MA USA

Studies of Westward Electrojets and Field-Aligned Currents in the Magnetotail During Substorms: Implications for Magnetic Field Models ***Final Report***

Spence, Harlan E., Boston Univ., USA; [1996]; 33p; In English

Contract(s)/Grant(s): NAGw-3953

Report No.(s): NASA/CR-97-206718; NAS 1.26:206718; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This section outlines those tasks undertaken in the final year that contribute integrally to the overarching project goals. Fast, during the final year, it is important to note that the project benefited greatly with the addition of a Boston University graduate student, Ms. Karen Hirsch. Jointly, we made substantial progress on the development of and improvements to magnetotail magnetic field and plasma models. The ultimate aim of this specific task was to assess critically the utility of such models for mapping low-altitude phenomena into the magnetotail (and vice-versa). The bulk of this effort centered around the finite-width- magnetotail convection model developed by and described by Spence and Kivelson (J. Geophys. Res., 98, 15,487, 1993). This analytic, theoretical model specifies the bulk plasma characteristics of the magnetotail plasma sheet (number density, temperature, pressure) across the full width of the tail from the inner edge of the plasma sheet to lunar distances. Model outputs are specified by boundary conditions of the source particle populations as well as the magnetic and electric field configuration. During the reporting period, we modified this code such that it can be interfaced with the auroral particle precipitation model developed by Dr. Terry Onsager. Together, our models provide a simple analytic specification of the equatorial distribution of fields and plasma along with their low-altitude consequences. Specifically, we have built a simple, yet powerful tool which allows us to indirectly 'map' auroral precipitation signatures (VDIS, inverted-V's, etc.) measured by polar orbiting spacecraft in the ionosphere, to the magnetospheric equatorial plane. The combined models allow us to associate latitudinal gradients measured in the ion energy fluxes at low-altitudes with the large-scale pressure gradients in the equatorial plane. Given this global, quasi-static association, we can then make fairly strong statements regarding the location of discrete features in the context of the global picture. We reported on our initial study at national and international meetings and published the results of our predictions of the low-altitude signatures of the plasma sheet. In addition, the PI was invited to contribute a publication to the so-called 'Great Debate in Space Physics' series that is a feature of EOS. The topic was on the nature of magnetospheric substorms. Specific questions of the when and where

a substorm occurs and the connection between the auroral and magnetospheric components were discussed in that paper. This paper therefore was derived exclusively from the research supported by this grant. Attachment: Empirical modeling of the quite time nightside magnetosphere.' 'CRRES observations of particle flux dropout event.' The what, where, when, and why of magnetospheric substorm triggers'. and 'Low altitude signature of the plasma sheet: model prediction of local time dependence'.
Author
Electrojets; Magnetic Storms; Magnetic Fields; Mathematical Models; Particle Precipitation; Conferences; Field Aligned Currents; Research and Development

19980038330 American Cyanamid Co., Bound Brook, NJ USA
Frontier Geoplasma Research Ionosphere, Polar, Auroral, Coupling Processes ***Final Report, 1 Apr. 1993 - 30 Jun. 1996***
Chang, Tom T., American Cyanamid Co., USA; Nov. 16, 1996; 20p; In English
Contract(s)/Grant(s): F49620-93-I-0287
Report No.(s): AD-A338006; AFRL-SR-BL-TR-98-0203; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Center for Theoretical Geoplasma Physics was established at MIT through an AFOSR University Research Initiative grant. The goal of the Center since its inception has been to develop and maintain a program of excellence in interdisciplinary geoplasma research involving the mutual interaction of ionospheric scientists, aeronomists, plasma physicists and numerical analysts. During the past three years under the current research Grant 'Frontier Geoplasma Research', members of the center have made seminal contributions to a number of definitive research findings in the fundamental understanding of the polar wind, the black aurorae curls, ionospheric turbulence, particle acceleration, and the phenomenon of coupling between the ionosphere and magnetosphere. Some of the results of these research activities have already found practical applications toward the mission of the Air Force by scientists at the Geophysics Directorate of the Phillips Laboratory, particularly those affiliated with the research group headed by Dr. J.R. Jasperse of the Ionospheric Effects Branch.
DTIC
Auroras; Geophysics; Particle Acceleration; Theoretical Physics; Experimentation

19980038338 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
SOIl Moisture Determinations Using Capacitance Probe Methodology
Atkins, Ronald T., Army Cold Regions Research and Engineering Lab., USA; Pangburn, Timothy, Army Cold Regions Research and Engineering Lab., USA; Bates, Roy E., Army Cold Regions Research and Engineering Lab., USA; Brockett, Bruce E., Army Cold Regions Research and Engineering Lab., USA; Jan. 1998; 49p; In English
Report No.(s): AD-A337497; CRREL-SP-98-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Determining soil moisture content by measuring the dielectric constant of the soil is not a new concept. However, determining the dielectric constant by measuring capacitance directly rather than through the use of time domain reflectometry (TDR) systems is a relatively new approach to soil moisture measurements. A unique probe assembly and a readout device that measures voltage drop and phase shift were developed and used for direct capacitance measurements. The capacitance measurement was calibrated using known capacitors and resistors. SOIl moisture measurements were calibrated by adding known amounts of distilled water to dry soil enclosed in a known volume. The effect of salinity on the measurement technique was evaluated. Once calibration had been accomplished, actual soil moisture measurements at three test depths through an entire winter's freeze-thaw cycle demonstrated the feasibility of using this capacitance measurement system. The dielectric constants measured using this fixed-frequency capacitance measurement system fall within the same general range as the values obtained using TDR equipment with the Topp or Roth general calibration equations, and they could probably be used directly in these equations after minor corrections. The conclusions drawn from these tests are that this measurement technique could and should be developed as an easier, more economical, and more easily automated and calibrated system for soil moisture measurement.
DTIC
SOIl Moisture; Permittivity; Capacitance; Electrical Measurement

19980038391 Lamont-Doherty Geological Observatory, Palisades, NY USA
Seismic Source and Structure in Iran from Joint Seismic Program Array Data ***Final Report, 1 Oct. 1995 - 30 Sep. 1997***
Kim, Won-Young, Lamont-Doherty Geological Observatory, USA; Aharonian, V., Lamont-Doherty Geological Observatory, USA; Lerner-Lam, A. L., Lamont-Doherty Geological Observatory, USA; Richards, Paul G., Lamont-Doherty Geological Observatory, USA; Feb. 25, 1998; 54p; In English
Contract(s)/Grant(s): F49620-95-I-0026
Report No.(s): AD-A338056; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Our Final Report consists of the paper titled "Discrimination of Earthquakes and Explosions in Southern Russia using Regional High-Frequency Three-Component Data from the IRIS/JSP Caucasus Network." In this paper, we analyzed high-frequency regional records from small earthquakes (magnitude less than 4.5), and comparable magnitude chemical explosions to find a reliable seismic discriminant in southern Russia near Kislovodsk. The digital, three-component seismograms recorded during 1992 by the Caucasus Network operated by Lamont-Doherty Earth Observatory since 1991 in the distance ranges 15 to 233 km are used. We find that the Pg/Lg spectral ratios of rotated, three-component regional records improve the discrimination power of the spectral ratio method over the vertical-component Pg/Lg ratios by about 4%. But we find that an even better discriminant is the Pg/Lg spectral ratio of the three-component regional records corrected for the free surface effect. In the frequency band 8-18 Hz, the free surface corrected three-component Pg/Lg spectral ratio provides discrimination power with a total misclassification probability of only 2.6%. Free surface corrected and network averaged Pg/Lg spectral ratios provide transportability of the spectral ratio method to various regions worldwide.
DTIC
Seismic Waves; Earthquakes; Seismograms; Structural Properties (Geology)

19980040944 Massachusetts Inst. of Tech., Earth Resources Lab., Cambridge, MA USA
Characterization of Seismic Sources Using Empirical Green's Functions ***Final Report, 1 Jul. 1996 - 30 Jun. 1997***
Rieven, Shirley A., Massachusetts Inst. of Tech., USA; Rodi, William L., Massachusetts Inst. of Tech., USA; Nov. 21, 1997; 67p; In English
Contract(s)/Grant(s): F49620-94-I-0273
Report No.(s): AD-A337812; AFRL-SR-BL-TR-98-0187; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Our work on the 1993 micro earthquake swarm at the Larderello geothermal field suggests that the most significant obstacle to the practical application of correlation techniques, such as EGFs or relative event location for seismic events recorded at regional distances, is due to the degree of waveform complexity that is related solely to scattering effects along the path. In this study, we showed that despite similar focal mechanisms and a regional scale that is on the order of 1 to 2 wavelengths, the complexity of the waveforms was severe, particularly for S waves. We showed that the event waveform types exhibited at least two distinctly different characters, thus forcing the use of more than one master event. We show that the practical difficulties were partially mitigated by a very careful and detailed analysis of correlation coefficients between master and slave events and multiple pass culling of the rms residuals from the inversion results. This effort clearly reduces the efficiency with which these techniques can be applied to large clusters and presents some new challenges in developing practical algorithms. However, in the case of the Larderello 1993 cluster, we are encouraged that the final result so dearly agreed with known geologic structures. This suggests that refinements of the correlation techniques, in ways that reduce the effects of scattering, may further improve the results. One possible direction may be to introduce more thorough modeling of the scattered wavefield and removal of the non essential phases from the waveform. This may improve the correlation coefficients by increasing the usable window length.
DTIC
Seismology; Waveforms; Earthquakes; Structural Properties (Geology)

19980040947 Indiana Univ., Dept. of Geological Sciences, Bloomington, IN USA
Broadband Signal Enhancement of Seismic Array Data: Application to Long-period Surface Waves and High-frequency Wavefields ***Final Report, 1 Nov. 1993 - 30 Jun. 1997***
Pavlis, Gary L., Indiana Univ., USA; Jan. 31, 1998; 7p; In English
Contract(s)/Grant(s): F49620-94-I-0039
Report No.(s): AD-A337819; AFRL-SR-BL-TR-98-0168; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The objectives of this program of broadband signal enhancement of seismic array data were the: (a) Development of new techniques for enhancement of low signal-to-noise surface wave signals recorded by broadband seismic arrays. The tasks were: Assembly of test data sets; Estimation of dispersion curves for reference events; Algorithm development. (b) Research on fundamental properties of high-frequency wavefields. The tasks were: Analysis of array data using scientific visualization tools; Analysis of signal coherence versus receiver separation and frequency for different array data; Analysis of frequency dependent polarization for different array data.
DTIC
Broadband; Seismographs; Seismology; Receivers

19980041205 Naval Research Lab., Command, Control, Communications, Computers and Intelligence Branch, Washington, DC USA

Verification and Validation of Tropospheric Model/Database

Choi, Jun-Ho, Naval Research Lab., USA; Sung, Kwak, Naval Research Lab., USA; Melton, Mara, Naval Research Lab., USA; Jan. 19, 1998; 68p; In English

Report No.(s): AD-A336881; NRL-MR-8140-98-8130; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A verification and validation of tropospheric models and databases has been performed based on ray tracing algorithm, statistical analysis, test on real time system operation, and other technical evaluation process. Databases are examined for pressure levels, adequate humidity, and temperature representation with respect to each layer and location. Any missing grid point and wrong data base been corrected or inserted through a linear interpolation process. Three models are verified through 130 areas of interest in order to avoid any complexity and time. Model performances are examined for time delay, standard deviation, angle of arrival and azimuth sensitivity. Modified exponential model out performs other models and ECM or HIRAS data are more realistic in applying to the operating system.

DTIC

Atmospheric Models; Troposphere; Ray Tracing; Real Time Operation; Statistical Analysis

47
METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

19980037019 National Environmental Satellite Service, Satellite Research Lab., Camp Springs, MD USA

NOAA'S MSU Time Series For Detecting Climate Change

Goldberg, Mitchell D., National Environmental Satellite Service, USA; Crosby, David S., National Environmental Satellite Service, USA; Chung, Wenchi, SM Systems and Research Corp., USA; Eighth Conference on Satellite Meteorology and Oceanography; 1996, pp. 466-469; In English; Conference on Satellite Meteorology and Oceanography, 28 Jan. - 2 Feb. 1996, Atlanta, GA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The measurements from the Microwave Sounding Unit (MSU), on board NOAA's operational polar orbiting satellites, have gained recognition during the past few years as a measure of deep layer mean temperature for long term monitoring of climate change (Spencer and Christy (1992a, l992b, 1993), Spencer, et al (1990)) The MSU has 4 channels measuring outgoing radiation at 50.31, 53.73, 54.96 and 57.95 GHz. The first MSU was launched in 1979 and to date its replacements have provided nearly complete daily coverage of the earth by scanning across the orbital track at +/- 47.35 degrees about nadir at approximately 9.47 degree increments. The MSU's 6 view angles results in the projection on the earth of 11 Fields of View (FOV) for each scanline. The highest peaking group of weighting functions is for MSU channel 4, followed by MSU channels 3 and 2. The higher peaking weighting functions in each channel grouping are associated with larger off-nadir angles. Because radiance in the 50 - 60 GHz spectral region is extremely linear with temperature, the observations can be interpreted as deep layer mean temperatures for the layer defined by the weighting function. This is not true for infrared spectral region, where the relationship between temperature and radiance can be very nonlinear. Microwave observations are usually expressed in units of temperature (brightness temperature), which can be obtained from radiance using the inverse form of the Planck function.

Author

Climate Change; Brightness Temperature; Detection; Infrared Radiation

19980037419 National Environmental Satellite Service, Office of Research and Applications, Washington, DC USA

Quantitative Precipitation Forecasting (QPF): The End-to-End-Forecasting Process Using Satellite Data and Numerical Weather Prediction Models

Scofield, R. A., National Environmental Satellite Service, USA; Kusselson, S., National Environmental Satellite Service, USA; 15th Conference on Weather Analysis and Forecasting; 1996, pp. J142-J145; In English; Conference on Weather Analysis and Forecasting, 19-23 Aug. 1996, Norfolk, VA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Quantitative Precipitation Forecasting (QPF) is the ultimate in scientific investigation and one of the greatest challenges in weather forecasting. Even though QPF has improved over the years, there is still a need for substantial improvement in predicting

precipitation: amounts, location, and time of occurrence. This paper will briefly describe the thought processes, questions asked, and the use of satellite data in computing QPFs.
Author
Numerical Weather Forecasting; Predictions

19980037619 NASA Goddard Space Flight Center, Greenbelt, MD USA
Global Warming Estimation From Microwave Sounding Unit
Prabhakara, C., NASA Goddard Space Flight Center, USA; Iacovazzi, R., Jr., Raytheon STX Corp., USA; Yoo, J.-M., Ewha Woman's Univ., Korea, Republic of; Dalu, G., Consiglio Nazionale delle Ricerche, Italy; Feb. 1998; 24p; In English
Contract(s)/Grant(s): RTOP 913-00-00
Report No.(s): NASA/TM-1998-206646; Rept-98A00404; NAS 1.15:206646; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Microwave Sounding Unit (MSU) Ch 2 data sets, collected from sequential, polar-orbiting, Sun-synchronous National Oceanic and Atmospheric Administration operational satellites, contain systematic calibration errors that are coupled to the diurnal temperature cycle over the globe. Since these coupled errors in MSU data differ between successive satellites, it is necessary to make compensatory adjustments to these multisatellite data sets in order to determine long-term global temperature change. With the aid of the observations during overlapping periods of successive satellites, we can determine such adjustments and use them to account for the coupled errors in the long-term time series of MSU Ch 2 global temperature. In turn, these adjusted MSU Ch 2 data sets can be used to yield global temperature trend. In a pioneering study, Spencer and Christy (SC) (1990) developed a procedure to derive the global temperature trend from MSU Ch 2 data. Such a procedure can leave unaccounted residual errors in the time series of the temperature anomalies deduced by SC, which could lead to a spurious long-term temperature trend derived from their analysis. In the present study, we have developed a method that avoids the shortcomings of the SC procedure, the magnitude of the coupled errors is not determined explicitly. Furthermore, based on some assumptions, these coupled errors are eliminated in three separate steps. Such a procedure can leave unaccounted residual errors in the time series of the temperature anomalies deduced by SC, which could lead to a spurious long-term temperature trend derived from their analysis. In the present study, we have developed a method that avoids the shortcomings of the SC procedures. Based on our analysis, we find there is a global warming of 0.23+/-0.12 K between 1980 and 1991. Also, in this study, the time series of global temperature anomalies constructed by removing the global mean annual temperature cycle compares favorably with a similar time series obtained from conventional observations of temperature.
Author
Microwave Sounding; Global Warming; Diurnal Variations; Temperature Measurement; Temperature Gradients

19980038073 Colorado State Univ., Cooperative Inst. for Research in the Atmosphere, Fort Collins, CO USA
RAMSDIS in Digital Satellite Data Training and Analysis
Molenar, Debra, Colorado State Univ., USA; Schrab, Kevin J., Colorado State Univ., USA; Purdom, James F. W., Colorado State Univ., USA; Gosden, Hiro, Colorado State Univ., USA; 12th International Conference on IIPS for Meteorology, Oceanography, and Hydrology; 1996, pp. 160-163; In English; International Conference on IIPS for Meteorology, Oceanography, and Hydrology, 28 Jan. - 2 Feb. 1996, Atlanta, GA, USA
Contract(s)/Grant(s): NOAA-NA37J0202; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The RAMM Advanced Meteorological Satellite Demonstration and Interpretation System (RAMSDIS) has been providing digital satellite data to select National Weather Service Forecast Offices across the U.S for over 2 years. RAMSDIS consists of a low cost Pentium 90 Mhz workstation running MclDAS-OS2 with many enhancements developed at the NOAA/NESDIS/RAMM Branch and CIRA These enhancements include image display in SuperVGA (SVGA) mode (640 x 480 pixels with 256 colors), separate image and text monitors, and a user friendly menu system accessible via function keys. The workstation products, software and hardware are described in detail by Molenar, et al. (1994). The RAMSDIS project was developed to make high quality digital satellite imagery available to NWS Forecast Offices as a means of familiarizing forecasters with use of the data for GOES-8 evaluation and in preparation for AWIPS implementation. RAMSDIS allows for customized product ingest at each forecast site. Data are sectorized on a server and transferred to NWS sites via Internet. RAMSDIS also includes several satellite data analysis applications developed at the CIRA/RAMM Branch.
Author
Meteorological Satellites; Meteorological Services; Digital Data; Satellite Imagery

19980038125 Colorado State Univ., Cooperative Inst. for Research in the Atmosphere, Fort Collins, CO USA

Cloud Liquid Water Path Comparisons from Passive Microwave and Solar Reflectance Satellite Measurements: Assessment of Sub-Field-of-View Cloud Effects in Microwave Retrievals

Greenwald, Thomas J., Colorado State Univ., USA; Christopher, Sundar A., South Dakota School of Mines and Technology, USA; Chou, Joyce, South Dakota School of Mines and Technology, USA; Journal of Geophysical Research; Aug. 27, 1997; ISSN 0148-0227; Volume 102, No. D16, pp. 19,585-19,596; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAH04-94-G-0420; NAGw-3966

Report No.(s): NASA/CR-97-207331; NAS 1.26:207331; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Satellite observations of the cloud liquid water path (LWP) are compared from special sensor microwave imager (SSM/I) measurements and GOES 8 imager solar reflectance (SR) measurements to ascertain the impact of sub-field-of-view (FOV) cloud effects on SSM/I 37 GHz retrievals. The SR retrievals also incorporate estimates of the cloud droplet effective radius derived from the GOES 8 3.9-micron channel. The comparisons consist of simultaneous collocated and full-resolution measurements and are limited to nonprecipitating marine stratocumulus in the eastern Pacific for two days in October 1995. The retrievals from these independent methods are consistent for overcast SSM/I FOVS, with RMS differences as low as 0.030 kg/sq m, although biases exist for clouds with more open spatial structure, where the RMS differences increase to 0.039 kg/sq m. For broken cloudiness within the SSM/I FOV the average beam-filling error (BFE) in the microwave retrievals is found to be about 22% (average cloud amount of 73%). This systematic error is comparable with the average random errors in the microwave retrievals. However, even larger BFEs can be expected for individual FOVs and for regions with less cloudiness. by scaling the microwave retrievals by the cloud amount within the FOV, the systematic BFE can be significantly reduced but with increased RMS differences of O.046-0.058 kg/sq m when compared to the SR retrievals. The beam-filling effects reported here are significant and are expected to impact directly upon studies that use instantaneous SSM/I measurements of cloud LWP, such as cloud classification studies and validation studies involving surface-based or in situ data.

Author

Cloud Cover; Drops (Liquids); Field of View; Satellite Observation; Remote Sensing; Microwave Imagery; Marine Meteorology

19980038152 Space Computer Corp., Santa Monica, CA USA

Covert Micro Weather Station for Littoral Areas ***Final Report***

Dec. 1997; 20p; In English

Contract(s)/Grant(s): N00014-95-C-6005; Proj. R0118

Report No.(s): AD-A336366; NRL/CR/7406-98-0001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Micro Weather Station (MWS) is intended to be a highly miniaturized unattended, air-deployable and expendable package tor the clandestine collection of meteorological and other environmental data in littoral land areas. (It is anticipated that the basic MWS design may be modified for marine use at a later date.) The operational version of the MWS will contain a suite of microsensors, a GPS receiver, a satellite communications transmitter, a digital processor with interface electronics, and a self contained power supply with solar cells. It will be packaged to be as small and inconspicuous as possible, ruggedized to permit deployment by ejection from aircraft, and designed for low cost, large-scale production. It should have an operational lifetime of several months with data sampling and transmission performed once per half-hour.

DTIC

Weather Stations; Data Sampling; Navigation Satellites; Coastal Currents

19980038255 Pacific-Sierra Research Corp., Santa Monica, CA USA

Low Frequency Atmospheric Noise Studies and Long Wave Technology Interfaces, ***19 Aug. 1993 - 18 Apr. 1997***

Warber, Chris R., Pacific-Sierra Research Corp., USA; Jan. 01, 1998; 20p; In English

Contract(s)/Grant(s): DNA001-93-C-0146

Report No.(s): AD-A336493; PSR-2707; DSWA-TR-97-38; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of the work done under contract DNA 001-93-C-0146 are discussed. This work included changes and improvement to the long wave noise propagation code LNP, development of a new ground conductivity model for use in LNP and as a

separate code. In addition, under this contract we demonstrated that LNP could be used in a system to forecast noise levels in a manner similar to weather forecasts. The techniques developed to do this are discussed.
DTIC
Noise Propagation; Atmospherics; Communication

19980038343 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Department of Meteorology, *1 Jan. - 31 Dec. 1996*
Wash, Carlyle H., Naval Postgraduate School, USA; Davidson, Kenneth L., Naval Postgraduate School, USA; Nov. 1997; 55p; In English
Report No.(s): AD-A337512; NPS-09-97-008; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report contains summaries of research projects in the Department of Meteorology. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts.
DTIC
Meteorology; Research Projects

19980038353 Naval Postgraduate School, Monterey, CA USA
Southern Hemisphere Application of the Systematic Approach to Tropical Cyclone Track Forecasting, Part 1, Environmental Structure Characteristics *Interim Report, Dec. 1997 - Nov. 1998*
Bannister, Anthony J., Naval Postgraduate School, USA; Boothe, Mark A., Naval Postgraduate School, USA; Carr, Lester E., III, Naval Postgraduate School, USA; Elsberry, Russell L., Naval Postgraduate School, USA; Dec. 1997; 104p; In English
Report No.(s): AD-A337224; NPS-MR-98-001-PT-1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The environment structure conceptual models of the Systematic Approach to Tropical Cyclone Track Forecasting technique of Carr and Elsberry are applied to all Southern Hemisphere tropical cyclones du ring January 1994 - June 1997. Whereas three of the four synoptic patterns from the western North Pacific could be applied with relatively small modifications, a new High (H) amplitude synoptic pattern was defined to classify the situations with large meridional penetrations of mid-latitude troughs deep into the Southern Hemisphere tropics. Some changes in terminology were required to describe the synoptic regions that have characteristic track directions. All 1592 cases during the period could be described by these four synoptic patterns and 11 synoptic regions. Important track changes were found to be associated with transitions between these synoptic patterns and regions. Three binary tropical cyclone interactions defined for the Western North Pacific were adapted for use in the Southern Hemisphere with considerable success. A preliminary climatology of occurrences for the synoptic pattern/region combinations, ions, transitions between combinations, and binary tropical cyclone interactions are calculated. Sequences of synoptic analyses related to these transitions are described to aid in the application.
DTIC
Southern Hemisphere; Tropical Storms; Forecasting; Weather Forecasting; Environment Models

19980040079 California Univ., Dept. of Atmospheric Sciences, Mammoth Lakes, CA USA
Modeling of Cloud/Radiation Processes for Cirrus Cloud Formation *Final Report, 1 Apr. 1994 - 30 Sep. 1997*
Liou, K. N., California Univ., USA; Ou, S. C., California Univ., USA; Gu, Y., California Univ., USA; Yang, P., California Univ., USA; Frankel, D., California Univ., USA; Nov. 30, 1997; 52p; In English
Contract(s)/Grant(s): F49620-94-I-0142
Report No.(s): AD-A336787; AFRL-SR-BL-TR-98-0135; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This technical report includes five reprints and pre-prints of papers associated with the modeling of cirrus cloud and radiation processes as well as remote sensing of cloud optical and microphysical properties from an airborne spectrometer based on radiative transfer principles. The time-dependent two-dimensional cirrus model includes a second-order turbulence closure scheme, an advanced interactive radiative transfer scheme, and ice microphysics parameterization. This model is used to understand the physical processes governing the formation and evolution of cirrostratus clouds.
DTIC
Cirrus Clouds; Two Dimensional Models; Cloud Physics; Radiative Transfer

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OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19980037952 Geological Survey, Water Resources Div., Lansing, MI USA
Projecting Ice-Affected Streamflow by Extended Kalman Filtering
Holtschlag, David J., Geological Survey, USA; Parker, Charles T., Geological Survey, USA; Grewal, Mohinder S., Geological Survey, USA; Dec. 1997; 47p; In English
Report No.(s): AD-A335228; CRREL-97-8; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An extended Kalman filter was developed to automate the real-time projection of ice-affected streamflow, based on routine measurements of stage and air temperature and the relation between stage and flow during open-water conditions. The form accommodates three dynamic modes of ice effects: sudden formation-ablation, stable ice conditions, and final elimination. The filter was applied to historical data from two long-term stream-flow-gaging stations. They were stable and parameters converged for both stations, producing estimates that were highly correlated with and linearly related to published streamflow values in a log-transformed metric. At St. John River at Dickey, Maine, logarithms of projected streamflow values were within 8% of the logarithms of published values 87.2% of the time and within 15% of published values 96.6% of the time during periods of ice effects. At Platte River at North Bend, Nebraska, logarithms of projected streamflow values were within 8% of the logarithms of published daily values 90.7% of the time and within 15%, 97.7% of the time during ice-affected conditions. This extended Kalman filter allows estimation of ice-affected streamflow at other gaging stations by adjusting filter parameters to site-specific conditions.
DTIC
Kalman Filters; Ice Formation

19980038238 Northwest Research Associates, Inc., Bellevue, WA USA
The Importance of Alongshore Nonuniformity In Longshore Current Predictions ***Final Report, 20 Nov. 1994 - 19 Nov. 1997***
Oltman-Shay, John, Northwest Research Associates, Inc., USA; Putrevu, Uday, Northwest Research Associates, Inc., USA; Feb. 04, 1998; 4p; In English
Contract(s)/Grant(s): N00014-95-C-0011
Report No.(s): AD-A337201; NWRA-CR-98-R179; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The long-term goal of this research is to increase our understanding of near shore (shore-line to nominally 15 m depth) fluid dynamics and to enhance our predictive modeling of waves and currents in that region. The three year objective funded in this contact was to investigate the effects of longshoreman variations of the bottom topography and short-wave field on near shore currents. This final report describes the tasks we under took to achieve our objective, the results of these tasks, the scientific impacts of our results, and lists the publications associated with this contract.
DTIC
Water Waves; Fluid Dynamics; Coastal Currents; Ocean Bottom

19980038337 Naval Postgraduate School, Monterey, CA USA
Numerical Simulation of Drifter Response to Labrador Sea Convection
Harcourt, R., Naval Postgraduate School, USA; Jiang, L., Naval Postgraduate School, USA; Garwood, R. W., Naval Postgraduate School, USA; Feb. 1997; 80p; In English
Report No.(s): AD-A338045; NPS-OC-98-001; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report describes numerical simulation of two types of idealized drifters: pure Lagrangian drifters and the isobaric drifters. A Large Eddy Simulation (LES) model was used to predict the fully turbulent non-hydrostatic evolution of the oceanic flow fields that are typical of the Labrador Sea. The LES simulation indicates that either free or forced convection may dominate, depending upon the magnitudes of the wind stress and the net surface heat fluxed out of the ocean surface. Free convection predominates in the winter regimes of the periphery of the polar seas, especially in the very deeply convecting regions of open water adjacent to marginal ice zones. Forced convection is more dominant in the stable ice covered regions of the polar seas experiencing strong wind stirring and kinetic energy exchange with the ice. Forced convection may be an important precursor to free convection, and the organized cells of forced convection may help dilate the ice field to enhance heat and buoyancy exchange between the OPBL and the atmosphere.
DTIC
Numerical Analysis; Lagrangian Function; Air Water Interactions; Convection Cells; Energy Transfer

19980039332 New Hampshire Univ., Ocean Process Analysis Lab., Durham, NH USA

Fuzzy Classification of Ocean Color Satellite Data for Bio-optical Algorithm Constituent Retrievals ***Quarterly Report, 1 Jan. - 31 Mar. 1998***

Campbell, Janet W., New Hampshire Univ., USA; Apr. 15, 1998; 28p; In English

Contract(s)/Grant(s): NAS5-96063

Report No.(s): NASA/CR-1998-207771; NAS 1.26:207771; ansm-ure-opc4-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ocean has been traditionally viewed as a 2 class system. Morel and Prieur (1977) classified ocean water according to the dominant absorbent particle suspended in the water column. Case 1 is described as having a high concentration of phytoplankton (and detritus) relative to other particles. Conversely, case 2 is described as having inorganic particles such as suspended sediments in high concentrations. Little work has gone into the problem of mixing bio-optical models for these different water types. An approach is put forth here to blend bio-optical algorithms based on a fuzzy classification scheme. This scheme involves two procedures. First, a clustering procedure identifies classes and builds class statistics from in-situ optical measurements. Next, a classification procedure assigns satellite pixels partial memberships to these classes based on their ocean color reflectance signature. These membership assignments can be used as the basis for a weighting retrievals from class-specific bio-optical algorithms. This technique is demonstrated with in-situ optical measurements and an image from the SeaWiFS ocean color satellite.

Author

Oceans; Fuzzy Systems; Remote Sensing; Satellite Imagery; Reflectance; Cluster Analysis

19980040945 Naval Research Lab., Coastal and Semi-Enclosed Seas Section, Stennis Space Center, MS USA

Use of Phase-Resolving Numerical Wave Models in Coastal Areas

Kaihatu, James M., Naval Research Lab., USA; Rogers, W. E., Naval Research Lab., USA; Hsu, Y. L., Naval Research Lab., USA; OReilly, William C., Naval Research Lab., USA; Jan. 1998; 17p; In English

Report No.(s): AD-A337813; NRL/PP/7322--97-0042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The choice of a particular wave model for use in nearshore wave climate forecasting or hindcasting is usually contingent upon the site to be considered and the processes to be modeled. Phase averaged spectral models such as SWAN, WAM or STWAVE are source based energy models which treat the wave field as a stochastic phenomenon. This particular formulation allows for the consideration of wind wave generation, among other source terms. These models (particularly STWAVE and SWAN) are able to simulate irregular wave propagation over coastal areas relatively efficiently; however, the propagation terms in these models are derived from ray theory and do not handle bathymetrically induced diffraction, which may be important in coastal areas. (It should be noted that STWAVE does not contain some accounting for diffraction as a diffusion of wave energy in the source terms). Phase resolving models such as REF/DIF1, REF/DIF-S and RCPWAVE by contrast, treat the wave field deterministically, tracing the free surface evolution over the domain. The irregular nature of the wave field can be accounted for by running several wave frequencies/directions through the model and calculating the statistics from the model results. This is often done by discretizing an input spectrum into frequency and direction bins, calculating the waveheight in each bin and then running them through the model. This formulation is most useful in the case of complex bathymetry and predominantly swell like conditions. Models in this latter class cannot account for wind wave generation.

DTIC

Oceans; Water Waves; Wave Generation; Wave Propagation; Forecasting

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LIFE SCIENCES (GENERAL)

19980037618 Scripps Institution of Oceanography, La Jolla, CA USA

Evidence for Life on Earth before 3,800 Million Years Ago

Mojzsis, S. J., Scripps Institution of Oceanography, USA; Arrhenius, G., Scripps Institution of Oceanography, USA; McKeegan, K. D., California Univ., USA; Harrison, T. M., California Univ., USA; Nutman, A. P., Australian National Univ., Australia; Friend, C. R. L., Oxford Univ., UK; Nature; Nov. 07, 1996; Volume 384, pp. 55-59; In English

Contract(s)/Grant(s): NAGw-2881

Report No.(s): NASA/CR-96-207592; NAS 1.26:207592; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

It is unknown when life first appeared on Earth. The earliest known microfossils (approx. 3,500 Myr before present) are structurally complex, and if it is assumed that the associated organisms required a long time to develop this degree of complexity, then the existence of life much earlier than this can be argued. But the known examples of crustal rocks older than approx. 3,500 Myr have experienced intense metamorphism, which would have obliterated any fragile microfossils contained therein. It is therefore necessary to search for geochemical evidence of past biotic activity that has been preserved within minerals that are resistant to metamorphism. Here we report ion-microprobe measurements of the carbon-isotope composition of carbonaceous inclusions within grains of apatite (basic calcium phosphate) from the oldest known sediment sequences a approx. 3,800 Myr-old banded iron formation from the Isua supracrustal belt, West Greenland, and a similar formation from the nearby Akilia island that is possibly older than 3,850 Myr. The carbon in the carbonaceous inclusions is isotopically light, indicative of biological activity; no known abiotic process can explain the data. Unless some unknown abiotic process exists which is able both to create such isotopically light carbon and then selectively incorporate it into apatite grains, our results provide evidence for the emergence of life on Earth by at least 3,800 Myr before present.
Author
Life Sciences; Metamorphism (Geology); Activity (Biology); Carbon Isotopes

19980038223 Pittsburgh Univ., Pittsburgh, PA USA
Development of a Novel Intravenous Membrane Oxygenator ***Final Report, 1 Jun. 1994 - 28 Sep. 1997***
Heinrich, Shelly, Pittsburgh Univ., USA; Hewitt, Todd, Pittsburgh Univ., USA; Hout, Mariah, Pittsburgh Univ., USA; Lund, Laura, Pittsburgh Univ., USA; Federspiel, William, Pittsburgh Univ., USA; Oct. 1997; 154p; In English
Contract(s)/Grant(s): DAMD17-94-C-4052
Report No.(s): AD-A337586; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Intravenous Membrane Oxygenator (IMO) at the University of Pittsburgh is intended to provide temporary and portable respiratory support to military and civilian personnel whose lungs are acutely damaged and impaired. The current IMO device consists of several hundred hollow fiber membranes (H:FMs) manifolded to gas supply lines for O2 delivery, CO2 removal, and helium supply to a balloon integer located within the fiber bundle. Rapid pulsation of the balloon generates additional convective flow of blood across the HFMs and enhances the rate of O2 delivery and CO2 removal This report describes key progress in the following areas: 1) hollow fiber membrane evaluation; 2) IMO prototype design development; 3) in-vitro gas exchange performance and characterization of the IMO; and 4) acute and chronic animal studies. The IMO prototypes developed under this contract exchanged O2 and CO2 at rates equal to or exceeding our design target for gas transfer per fiber surface area. This target is based on attaining 50% of the normal baseline metabolic requirements for O2 supply and CO2 removal with an IMO device of 0.4 to 0.5 sq m fiber surface area. The next phase of IMO development has already begun and involves scaling-up to full-size IMO devices intended for human implantation.
DTIC
Fabrication; Oxygen; Respirators; Armed Forces; Gas Exchange

19980038264 Walter Reed Army Medical Center, Washington, DC USA
Development of Ultra Long Duration Local Anesthetic Agents in a Rat Model ***Final Report, 15 Dec. 1992 - 31 Dec. 1995***
Kline, Mark D., Walter Reed Army Medical Center, USA; Nov. 1997; 72p; In English
Contract(s)/Grant(s): MIPR-93MM3511
Report No.(s): AD-A337587; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

For decades anesthesiologists have sought an agent that would provide local anesthesia lasting for days rather than hours. The ideal ultra-long duration local anesthetic agent would affect sensory but not motor fibers, be free of local irritant effects, have a high therapeutic index, and provide analgesia for several days. No agent currently exists that meets all these criteria. Lecithin-coated microcrystal technology shows promise in improving the delivery of local anesthetics and analgesics. In this study three different agents were developed and tested in animal models to establish possible clinical efficacy.
DTIC
Clinical Medicine; Anesthesiology; Anesthetics; Rats

52
AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980037233 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Insulated Skin Temperature and Cardiac Frequency as Indices of Thermal Strain during Work in Hot Environments
Taylor, Nigel A. S., Wollongong Univ., Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Nov. 1997; 18p; In English
Report No.(s): DSTO-TR-0590; AR-010-381; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., P.O. Box 4331, Melbourne Victoria 3001, Australia), Hardcopy, Microfiche

The paper reviews the possibility that thermal strain may be predicted or determined from changes within certain physiological variables. Key variables include body core temperature, cardiac frequency, sweat rate and skin blood flow. The possible use of a modified skin temperature and cardiac frequency are examined as a means of predicting impending heat disfunction or quantifying thermal strain. The two most promising techniques for possible monitoring of body core temperature are those of insulated transcutaneous and zero-gradient skin temperature measurements.
Author
Temperature Measurement; Skin Temperature (Biology); Heart; Cardiac Output

19980037577 Center for Naval Analyses, Alexandria, VA USA
A Cost-Benefit Analysis of Shipboard Telemedicine ***Final Report***
Garcia, Federico E., Center for Naval Analyses, USA; Stoloff, Peter H., Center for Naval Analyses, USA; Thomason, Janet E., Center for Naval Analyses, USA; Shia, Derek S., Center for Naval Analyses, USA; Sep. 1997; 90p; In English
Contract(s)/Grant(s): N00014-91-C-0002; Navy Proj. R0148
Report No.(s): AD-A334780; CRM-97-66; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Telemedicine (TM) is an umbrella term that covers various technologies used to transmit information for health services. TM uses electronic information and communication technologies to provide and support health care when distance separates the participants. In an effort to enhance medical services at sea, the Navy is considering taking TM beyond the demonstration phase by installing the equipment on over 300 ships and fleet Marine Force units. Because this would be a significant investment, the Surgeon General has asked CNA to determine the cost-effectiveness of the technology. We conducted a cost-benefit analysis on four telemedicine modalities: telephone and fax, e-mail and internet, video-teleconferencing, and teleradiology. These TM modalities can be enhanced with various digitized diagnostic instruments. We also conducted a cost-benefit analysis on the following instruments: detmascope, ophthalmoscope, otoscope, stethoscope, endoscope, electrocardiogram and defibrillator, and ultrasound.
DTIC
Ship to Shore Communication; Ships; Telemedicine; Information Systems; Health; Surgeons

19980037583 International Society of Toxinology, Morelos, Mexico
12th World Congress on Animal, Plant and Microbial Toxins ***Final Report, 1 Jul. 1997 - 31 Dec. 1997***
Possani, Lourival D., International Society of Toxinology, Mexico; Jan. 1998; 143p; In English, 21-26 Sep. 1997, Cuernavaca, Mexico
Contract(s)/Grant(s): DAMD17-97-I-7333
Report No.(s): AD-A335319; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche; Abstracts Only; Abstracts Only

This Congress took place in Cuernavaca, Morelos, Mexico. Approximately 320 participants from 30 different countries were present. The program included seven plenary lectures, six mini-symposia, 87 oral presentations in free communications sessions and 167 poster presentations. Only the plenary lectures and symposia will be covered here. The abstracts of the entire Congress will be printed by Toxicon, the official journal of the International Society on Toxinology (it is currently in press).
DTIC
Toxins and Antitoxins; Conferences

19980037717 Texas Univ., Galveston, TX USA
Molecular Study of Interactions Between P-Glycoprotein and Anticancer Drugs ***Final Report, 1 Aug. 1994 - 31 Jul. 1997***
Zhang, Jian-Ting, Texas Univ., USA; Aug. 1997; 20p; In English
Contract(s)/Grant(s): DAMD17-94-J-4419
Report No.(s): AD-A334403; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

P-glycoprotein is a plasma membrane protein that functions as a drug transporter and is responsible for multidrug resistance in some breast cancers. In the past one year, we have generated two site-specific antibodies and used them to determine the topologies of P-glycoprotein in multidrug resistant cancer cells. We found that P-glycoproteins in the plasma membrane of mammalian cells express at least two alternate topologies. This observation is consistent with our previous study using cell-free expression system. The more than one topology feature of P-glycoprotein may be responsible for its multifunctional nature. We have also been able to express the transmembrane domains of P-glycoprotein in bacteria. The success in this study will allow us to map the drug-binding domain in P-glycoprotein and study the drug-P-glycoprotein interactions.
DTIC
Proteins; Bacteria; Cancer; Antibodies; Mammary Glands; Cells (Biology)

19980037954 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Investigation of laser polarized xenon magnetic resonance ***Final Report, 1 Apr. 1996 - 30 Sep. 1997***
Walsworth, Ronald L., Smithsonian Astrophysical Observatory, USA; Feb. 1998; 8p; In English
Contract(s)/Grant(s): NAGw-5025
Report No.(s): NASA/CR-97-207602; NAS 1.26:207602; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Ground-based investigations of a new biomedical diagnostic technology: nuclear magnetic resonance of laser polarized noble gas are addressed. The specific research tasks discussed are: (1) Development of a large-scale noble gas polarization system; (2) biomedical investigations using laser polarized noble gas in conventional (high magnetic field) NMR systems; and (3) the development and application of a low magnetic field system for laser polarized noble gas NMR.
Derived from text
Nuclear Magnetic Resonance; Lasers; Xenon Isotopes

19980038044 Maryland Univ., College Park, MD USA
Symposium on Medical Dual-Use Technologies ***Final Report, 1 May 1995 - 31 Dec. 1995***
Declaris, Nicholas, Maryland Univ., USA; Jan. 1998; 62p; In English
Contract(s)/Grant(s): DAMD17-95-I-5042
Report No.(s): AD-A336405; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The goals of this symposium are: (1) to assess the current and future potential of a number of key technology areas of special interests to ARPA and to biomedical engineers and educators, and (2) to define the directions of future research in these interdisciplinary areas. Invited experts will summarize recent developments in their research area. Panel discussions, with audience participation, will focus on the challenges and benefits in advancing the technologies.
DTIC
ARPA Computer Network; Conferences; Engineers; Medical Services; Medical Personnel; Hybrid Propulsion

19980038154 Defence Research Establishment Suffield, Medicine Hat, Alberta Canada
Estimation of Human Toxicity From Animal Inhalation Toxicity Data: 1. Minute Volume-Body Weight Relationships Between Animals and Man
Bide, R. W., Defence Research Establishment Suffield, Canada; Armour, S. J., Defence Research Establishment Suffield, Canada; Yee, E., Defence Research Establishment Suffield, Canada; Oct. 1997; 50p; In English
Report No.(s): AD-A336351; DRES-SR-673; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The relationship between Body Weight (BW) and respiratory minute volume (Vm) was reviewed by collecting a data base from the literature of minute volume rates that encompassed species from mice at 12 g body weight to horses and a giraffe at 500 kg body weight. The data were separated into anesthetized and non-anesthetized groups and juvenile animals were removed from the non-anesthetized group. The final data set of non-anesthetized animals contained 131 studies representing 2125 animals and 18 species. The data show a power-law (allometric) relationship between the minute volume and body weight. The scaling or allometric parameters in this power-law have been estimated using a linear regression of the logarithms of the minute volume against body weight. The resulting allometric equations were; Log10Vm = -0.286+ 0.802 Log10BW or Vm = 0.518 BW0.802. From these equations a corresponding set of min ute volumes were obtained for various body weights of humans eg. 15.6 L/min for a 70 kg human. The results of the analyses were compared to similar studies in the literature. The relationship is recommended for military uses because it is derived from non-anesthetized, young adult mammals which are expected to mimic the soldier.
DTIC
Human Body; Body Weight; Toxicity; Laboratories

19980038197 University of Southern California, Los Angeles, CA USA

The Effect of a Moderate Aerobic Exercise Training Program on Ovarian Function ***Annual Report, 1 Sep. 1996 - 31 Aug. 1997***

Shames, Lisa S., University of Southern California, USA; Sep. 1997; 15p; In English

Contract(s)/Grant(s): DAMD17-96-I-6013

Report No.(s): AD-A336663; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is substantial evidence to suggest that estrogens play a key role in the etiology of breast cancer. Both cross-sectional studies of highly trained athletes and prospective studies of high intensity exercise training programs have found a higher frequency of anovulation, lower levels of estradiol and in some cases a shortened luteal phase length with associated lower estradiol levels among these women. However, little is known about the effects of moderate intensity exercise on ovarian function. We hypothesize that the observed reduction in risk with exercise is due to altered ovarian function. We are investigating the relationship between a moderate intensity exercise training program and ovarian function. Specifically we aim: (1) to determine whether changes occur in frequency of ovulation as a result of a 6 month exercise training program, (2) to determine whether changes occur in serum E2 levels in ovulatory and anovulatory cycles in these women, and (3) to determine the luteal phase menstrual cycle lengths of these women as a result of the training program. We are collecting blood and urine specimens and questionnaire data (over a three year period) from 120 premenopausal women. We expect to have completed data and preliminary findings on 39 women by December 1997.

DTIC

Physical Exercise; Reproduction (Biology); Physiological Tests; Physiological Responses

19980038225 Virginia Univ., Dept. of Biology, Charlottesville, VA USA

Control of Circadian Behavior by Transplanted Suprachiasmatic Nuclei and by the Tau Gene ***Final Report, 1 Sep. 1994 - 31 Aug. 1997***

Menaker, Micahel, Virginia Univ., USA; Aug. 1997; 17p; In English

Contract(s)/Grant(s): F49620-94-I-0356; AF Proj. 2312

Report No.(s): AD-A337450; AFRL-SR-BL-TR-98-0166; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mammalian retina was found to contain an independent circadian oscillator which regulates the synthesis of melatonin and has effects, through a presently unknown pathway, on the circadian rhythm of locomotor behavior in infact animals. Electrical recordings were successfully obtained from several brain regions of intact, behaving hamsters. The suprachiasmatic nucleus (SCN) expressed circadian rhythms of electrical activity with peak electrical activity during the animals' 'day' (inactive period), and low activity during the animals' night (active period). The electrical activity in the bed nucleus of the stria terminalis was in phase with that in the SCN. All other brain regions studied showed electrical rhythms with the opposite phase. The circadian mutation tau was found to affect the period and the temperature compensation mechanism of the oscillator in the cultured retina as well as the dynamics of c-fos induction in the SCN. Tau mutant hamsters were found to have significantly altered responses of their circadian rhythms to GABAergic pharmacological agents. A model system was developed (using the green iguana) with which it is possible, for the first time, to study the interaction of multiple, distributed circadian oscillators. This is the only available experimental model of human circadian dissociation.

DTIC

Circadian Rhythms; Retina; Oscillators

19980038341 Yale Univ., New Haven, CT USA

Muscle and Liver Carbohydrates: Response to Military Task Performance by Women and Men ***Annual Report, 23 Sep. 1996 - 22 Sep. 1997***

Price, Thomas B., Yale Univ., USA; Oct. 1997; 42p; In English

Contract(s)/Grant(s): DAMD17-96-C-6097

Report No.(s): AD-A337501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During this first year we have made progress in three areas: (1) design of the exercise ergometer and development of a reliable experimental protocol, (2) validation of MRI as a viable method of measuring differential muscle recruitment in a local system (the lower leg with plantar flexion), and (3) development and implementation of a total body MR imaging protocol that enables the identification & differentiation of muscles that are recruited by our experimental protocol. In area 1 we have successfully implemented an experimental protocol that is reliable in a male population, we have not yet tested our protocol in a female population. We may need to reduce the mass of our weighted box in both populations to ensure that the female subjects can complete the task. In area 2 we demonstrated that MRI provides a viable tool to assess differential muscle recruitment patterns. In area 3 we have developed and implemented an echo planar total body MR imaging protocol that reliably measures total body muscle

recruitment during our experimental protocol. We have successfully completed a study with a male subject and have been able to identify differential muscle recruitment patterns. Although we were not able to study the number of subjects that we had initially hoped to study, the experimental protocol and MR techniques are ready. With the addition of a staff member to recruit subjects, we are currently screening subjects and preparing them for studies on a weekly to bi-weekly basis.
DTIC
Liver; Muscles; Carbohydrates

19980038345 Chicago Univ., Office of Research Administration, Chicago, IL USA
Phase Shifting Effects of Light and Activity on the Human Circadian Clock ***Final Report, 1 May 1994 - 31 Oct. 1997***
VanCauter, Eve, Chicago Univ., USA; Feb. 15, 1998; 18p; In English
Contract(s)/Grant(s): F49620-94-I-0203; AF Proj. 2312
Report No.(s): AD-A337545; Rept-15522; AFRL-SR-BL-TR-98-0189; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this research are to delineate basic mechanisms controlling the human circadian clock and to derive practical procedures to rapidly phase-shift human rhythms in real life situations. The focus is on the impact of the: interactions between circadian rhythmicity and sleep-wake regulation on endocrine function, metabolism, cardiovascular function, mood and cognition. The studies are designed to approximate real life conditions and examine conditions of circadian misalignment and sleep loss that are relevant to Air Force operations. This effort demonstrated that physical exercise is capable of phase-delaying human rhythms and that daytime exposure to dark may result in rapid phase-advances. We also showed that the subjective discomfort, fatigue, and decreased performance which occur following time shifts (i.e. the ”jet lag syndrome”) are associated not only with a misalignment of bodily rhythms but also with a prolonged elevation of a hormonal concentration in blood. Recent studies further indicated that partial sleep loss, whether acute or chronic, results in marked alterations of endocrine and metabolic function. These observations challenge the common belief that sleep deprivation affects mood and cognition, but not peripheral physiology, and emphasize the need to develop countermeasures to minimize decrements in both mental and physical function.
DTIC
Cardiovascular System; Circadian Rhythms; Clocks; Jet Lag

19980038360 Texas Univ., Medical Branch, Galveston, TX USA
Superoxide and Nitric Oxide Mechanisms in Traumatic Brain Injury and Hemorrhagic Hypotension ***Annual Report, 1 Dec. 1996 - 30 Nov. 1997***
DeWitt, Douglas S., Texas Univ., USA; Dec. 1997; 75p; In English
Contract(s)/Grant(s): DAMD17-97-I-7008
Report No.(s): AD-A337483; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Traumatic brain injury (TBI) reduces cerebral blood flow (CBF) and renders the brain vulnerable to secondary ischemia. Hypotension contributes to poor outcome after TBI in humans. We have prevented hypoperfusion and restored autoregulation after TBI. The goals of this project are to determine whether treatment based on our observations will prevent CBF reductions, brain edema and histological damage after TBI and hemorrhagic hypotension, and to understand the mechanisms that contribute to the efficacy of the proposed treatments. Specific Aim 1 addressed the hypothesis that impairment of cerebrovascular function will result in brain injury after TBI and hemorrhagic hypotension that would not occur after hypotension alone. Specific Aim 2 addressed the hypothesis that post-TBI cerebral hypoperfusion is caused by nitric oxide (NO)-dependent mechanisms. Specific Aim 3 addressed the hypothesis that increased production of super oxide during TBI and subsequent hypotension/resuscitation is responsible for the impaired cerebrovascular reactivity. Specific Aim 4 will address the hypothesis that small volume resuscitation with hyper tonic saline will restore cerebral circulatory and systemic hemodynamics without causing the pronounced changes in brain water diffusion seen after TBI and hypotension/resuscitation with shed blood.
DTIC
Nitric Oxide; Brain Damage; Hemorrhages; Hypotension

19980038364 Wright State Univ., Dayton, OH USA
Middle Cerebral Artery Blood Flow Velocity After Exposure to Sustained +Gz ***Interim Report, Jan. 1996 - Jun. 1997***
Kovitaya, Manaswee, Wright State Univ., USA; Tripp, Lloyd D., Jr., Wright State Univ., USA; Chelette, Tamara L., Wright State Univ., USA; Jun. 1997; 39p; In English
Contract(s)/Grant(s): F41624-95-C-6014; AF Proj. 7184
Report No.(s): AD-A337565; AL/CF-TR-1997-0159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Anecdotal information has been available for many years that G training over time increases a human's ability to tolerate G. However, little data exist to corroborate the observation. The main thrust of this study was to quantify the accumulative physiological effects of +Gz exposure on cerebral blood flow using transcranial Doppler. A total of six male and six female subjects participated in this study. The subjects experienced numerous G exposures ranging from 2.5 to 5.2 % during three days of centrifuge training. Total time at (i greater than 1 was 5.3 minutes. Changes in middle cerebral artery blood flow velocity during a squat-stand orthostatic challenge test before and after G exposures and then within seven days after each day of G exposure were observed. No significant changes in middle cerebral artery blood flow velocity were found. Further studies with more subjects, higher & levels, and more repeated & exposures of longer duration are suggested.
DTIC
Blood Flow; Brain Circulation; Blood Vessels; Arteries

19980040042 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Insulated Skin Temperature and Cardiac Frequency as Indices of Thermal Strain during Work in Hot Environments
Taylor, Nigel A., Wollongong Univ., Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Nov. 1997; 29p; In English
Report No.(s): AD-A335194; DSTO-TR-0590; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper reviews the possibility that thermal strain may be predicted or determined from changes within certain physiological variables. Key variables include body core temperature, cardiac frequency, sweat rate and skin blood flow. The possible use of a modified skin temperature and cardiac frequency are examined as a means of predicting impending heat dysfunction or quantifying thermal strain. The two most promising techniques for possible monitoring of body core temperature are those of insulated transcutaneous and zero-gradient skin temperature measurements.
DTIC
Body Temperature; Skin Temperature (Biology); Cardiac Output; Thermal Stresses

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19980037953 Klein Associates, Inc., Fairborn, OH USA
Applied Cognitive Task Analysis (ACTA) Methodology ***Final Report, Sep. 1994 - Apr. 1997***
Militello, Laura G., Klein Associates, Inc., USA; Hutton, Robert J. B., Klein Associates, Inc., USA; Pliske, Rebecca M., Klein Associates, Inc., USA; Knight, Betsy J., Klein Associates, Inc., USA; Klein, Gary, Klein Associates, Inc., USA; Nov. 1997; 193p; In English
Contract(s)/Grant(s): N66001-94-C-7034
Report No.(s): AD-A335225; NPRDC-TN-98-4; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The impact of technology on many tasks and functions has resulted in greatly increased demands on the cognitive skills of workers. More procedural or predictable tasks are now handled by smart machines, while humans have become responsible for difficult cognitive tasks. The increase in cognitive demands placed on workers has created a need for training that targets cognitive skills. In most cases, however, the task analyses that drive training development are conducted using methodologies that focus primarily on behaviors. The training community needs tools that will allow access to experienced based cognitive skills. The primary goal of this project was to develop streamlined methods of Cognitive Task Analysis that would fill this need. We have made important progression this direction. We have developed streamlined methods of Cognitive Task Analysis. Our evaluation study indicates that the methods are usable and aid in the development of important, accurate training materials addressing cognitive issues. In addition, we have developed a CD-based stand alone instructional package, which will make the Applied Cognitive Task Analysis (ACTA) tools widely accessible. A survey of the software conducted with both Navy Instructional Systems Specialists (ISSs) and private sector Instructional Designers indicates that the software is successful in communicating the ACTA techniques.
DTIC
Technologies; Education; Tasks; Mental Performance

19980038359 Colorado Univ., Dept. of Psychology, Boulder, CO USA

On Verification of Multiplication Facts: An Investigation Using Retrospective Protocols ***Interim Report, Aug. 1995 - Aug. 1996***

Romero, Stephen, Colorado Univ., USA; Sep. 1997; 63p; In English

Contract(s)/Grant(s): MDA903-86-K-0010; B74F61102C07

Report No.(s): AD-A337482; ARI-RN-97-33; ARI-RN-97-33; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Current theories of mental multiplication elicit two questions: (1) Do the same processes underlie answer production and answer verification, and (2) Does any theory centered around a single strategy suffice to explain the underlying mechanisms for these tasks? This study involved addition of retrospective protocols to a verification task, in two experiments. The patterns of effects for reaction times (RT) and errors in both experiments were similar to Campbell's (1991) findings, suggesting that the addition of the protocols did not significantly alter the task. Analysis of the protocols provided evidence that retrieval of the correct answer from memory and then comparison to the answer given was the modal strategy reported in both experiments but was not reported for 100% of the trials. These findings imply that the same processes that underlie production are involved. Furthermore, the use of protocols can facilitate differentiating what strategies are involved and provide evidence that any theory of this skill assuming one strategy will likely be incomplete.

DTIC

Mental Performance; Psychological Tests

19980038361 CASDE Corp., Alexandria, VA USA

Immersive Visualization of Complex Situations for Mission Rehearsal ***Final Report, Apr. 1996 - Jan. 1997***

Kasper, Peter K., CASDE Corp., USA; Sep. 1997; 21p; In English

Contract(s)/Grant(s): DASW01-96-C-0032; B74F61102C01

Report No.(s): AD-A337487; ARI-RN-97-35; ARI-RN-97-35; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The program objectives of this report included identification of an appropriate rehearsal scenario as well as the requirements and specifications for necessary computer hardware and software. Key considerations in identifying the training scenario were intrinsic benefit to the Army, effectiveness of virtual environments for training and benefit from implementation over a distributed computer system.

DTIC

Virtual Reality; Distributed Interactive Simulation; Education; Computer Programs

19980038362 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

Training Efficiently in Virtual Environments: Determinants of Distance Perception of Stationary Observers Viewing Stationary Objects ***Final Report, Feb. - Sep. 1995***

Witmer, Bob G., Army Research Inst. for the Behavioral and Social Sciences, USA; Kline, Paul B., Army Research Inst. for the Behavioral and Social Sciences, USA; Sep. 1997; 64p; In English

Report No.(s): AD-A337488; ARI-RN-97-36; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The accurate perception and estimation of distance is an important element of many military tasks. It is necessary for orienting oneself on the battlefield, for making optimal use of terrain features during navigation, and for judging the distance from one point to another. It is also a component of both route and configuration knowledge and acquisition. In order to maximize transfer from Virtual Environment (VE) to the real world, it is important to develop an understanding of the capabilities and limitations of this new training medium. Toward that end, the present study sought to gain insight about the conditions affecting distance estimation of VEs. The purpose of this research is to examine factors that influence the perception of distance in VEs. Two experiments were designed to investigate the relative effects of such factors on distance estimates of a stationary observer positioned at near and medium distances from an object. Factors found to improve distance estimates in these experiments will be incorporated into the design of VEs for subsequent investigations.

DTIC

Visual Perception; Virtual Reality; Space Perception; Distance

19980038380 Georgia Inst. of Tech., Atlanta, GA USA

Individual Feedback Propensities and Their Effects on Motivation, Training Success, and Performance ***Final Report, Jun. 1992 - Jun. 1997***

Herols, David M., Georgia Inst. of Tech., USA; Parsons, Charles K., Georgia Inst. of Tech., USA; Fedor, Donald B., Georgia Inst. of Tech., USA; Sep. 1997; 63p; In English

Contract(s)/Grant(s): MDA903-92-K-0107; B74F61102C10

Report No.(s): AD-A337479; ARI-RN-97-31; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This research project had as its goal the development, validation, and field testing of new measures of individual differences that assess people's propensities to seek, generate, or interpret performance feedback information in a particular way. Specifically, based on preliminary work, it was thought that internal and external propensities exist that make individuals more or less likely to prefer, rely on, seek, or attend to primarily internally or externally generated performance cues. These propensities, if identified and measured, would be related to skill acquisition, performance improvement, self regulatory processes, performance maintenance, as well as a variety of affective and cognitive responses to performance settings based on the interaction of the performer's feedback predispositions and the characteristics of the feedback available. In summary, this study proposed to help one better understand the role of dispositions in explaining how different individuals go about shaping their feedback environment, processing feedback information, and responding to such information. The driving belief behind this line of research has been that individuals differ in ways that are specific to their orientation toward performance feedback situations, and that such differences, if identified and appropriately measured, would be valuable in better understanding the links between feedback and performance as well as other outcomes of interest.

DTIC

Mental Performance; Feedback; Motivation

19980040094 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

Concept Vectors: A Synthesis of Concept Mapping and Matrices for Knowledge Representation in Intelligent Tutoring Systems

Dyson, Mark L., Air Force Inst. of Tech., USA; Dec. 16, 1997; 68p; In English

Report No.(s): AD-A335179; AFIT/GCS/ENG/97D-07; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A review of the literature relating to intelligent tutoring systems (ITS) reveals that the bulk of research to date is focused on the student, and on methods for representing the knowledge itself. From student models to learning schemas to presentation methods, comparatively little attention has been paid to the problem of educators attempting to build viable lesson plans for use in an ITS environment - yet when this problem is addressed in the literature, it is recognized as a potentially daunting one. This thesis addresses the problem of ITS lesson plan development by proposing a practical, computable approach for knowledge engineering that is based on proven classroom methods. The document then details a system for dynamically creating lesson plans from a knowledge base created under the described methodology, using already-established algorithms of proven tractability, and then discusses how this system can be integrated into existing and future ITS design.

DTIC

Knowledge Based Systems; Machine Learning

19980040950 Michigan Univ., Ann Arbor, MI USA

Foundation of Stimulus-Response/Stimulus-Stimulus Compatability ***Final Report, 1 Nov. 1993 - 31 Oct.1997***

Kornblum, Sylvan, Michigan Univ., USA; Feb. 10, 1998; 48p; In English

Contract(s)/Grant(s): F49620-94-I-0020; AF Proj. 2313

Report No.(s): AD-A337872; AFRL-SR-BL-TR-98-0180; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research described in this final report continues, and greatly extends our ongoing investigations of basic, elemental, cognitive processes in humans. During the period covered by the report we focussed on validating the original dimensional overlap model, testing some of its fundamental predictions, and recasting the model itself in a computational form. These efforts appear to have been successful. The original model and its taxonomy have become an effective integrative framework in an important domain of human performance (stimulus-stimulus, and stimulus-response compatibility in the broadest sense of these terms), and encompass, in a principled manner, a broad family of performance tasks representing classic problems in human cognition (e.g., Stroop and Stroop-like tasks, Eriksen and Eriksen-like paradigms, and Simon and Simon-like effects). Our work has resulted in the publication of 10 peer reviewed articles, with 4 manuscripts presently under review, one dissertation, and 17 presentations at professional meetings. The model has also contributed an important theoretical perspective to investigators working on psychophysiological and neurophysiological mechanisms of response production, and stimulus-response association processes. The principal goal for our future work is to develop and extend the model further, and test its new properties and implications. Some of these new properties span inter- as well as intra-trial phenomena, and mark the beginnings of the theoretical and empirical bridges that we were hoping, originally, to be able to build between the family of SRC tasks, and the central problems of cognition.

DTIC

Human Performance; Physiological Responses; Neurophysiology; Cognitive Psychology; Taxonomy

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980037427 NASA Marshall Space Flight Center, Huntsville, AL USA
Living Together in Space: The Design and Operation of the Life Support Systems on the International Space Station, Volume 1
Wieland, P. O., NASA Marshall Space Flight Center, USA; Jan. 1998; 302p; In English
Report No.(s): NASA/TM-1998-206956-Vol-1; M-850-Vol-1; NAS 1.15:206956-Vol-1; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The International Space Station (ISS) incorporates elements designed and developed by an international consortium led by the USA (U.S.), and by Russia. For this cooperative effort to succeed, it is crucial that the designs and methods of design of the other partners are understood sufficiently to ensure compatibility. Environmental Control and Life Support (ECLS) is one system in which functions are performed independently on the Russian Segment (RS) and on the U.S./international segments. This document describes, in two volumes, the design and operation of the ECLS Systems (ECLSS) on board the ISS. This current volume, Volume 1, is divided into three chapters. Chapter 1 is a general overview of the ISS, describing the configuration, general requirements, and distribution of systems as related to the ECLSS, and includes discussion of the design philosophies of the partners and methods of verification of equipment. Chapter 2 describes the U.S. ECLSS and technologies in greater detail. Chapter 3 describes the ECLSS in the European Attached Pressurized Module (APM), Japanese Experiment Module (JEM), and Italian Mini-Pressurized Logistics Module (MPLM). Volume II describes the Russian ECLSS and technologies in greater detail. These documents present thorough, yet concise, descriptions of the ISS ECLSS.
Author
International Space Station; Environmental Control; Life Support Systems; Aerospace Systems; Spacecraft Modules; Systems Engineering; Design Analysis

19980037532 Naval Surface Warfare Center, Carderock Div., Bethesda, MD USA
Material Considerations for the Navy Shipboard Waste Destruction System
Shifler, David A., Naval Surface Warfare Center, USA; Wong, Catherine R., Naval Surface Warfare Center, USA; Oct. 1997; 27p; In English
Contract(s)/Grant(s): Proj. PE60223N
Report No.(s): AD-A336524; NSWCCD-TR-61-97/14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Compliance with MARPOL environmental regulations has required the design of a waste management system to reduce the volume of solid shipboard waste and treat it so that it is safe to carry aboard ship. The U.S. Navy in cooperation with industry has developed a conceptual design of a Plasma Arc Waste Destruction System (PAWDS) capable of meeting strict shipboard weight, size, and operation criteria that has precluded the use of traditional commercial systems. The innovative system design has involved a thorough examination of candidate materials that should be capable of withstanding the processing of a variable waste stream that may include highly corrosive constituents. The structural components of the PAWDS should insure safety of personnel and ship by resisting degradation through high temperature corrosion, erosion, thermal cycling, and other effects.
DTIC
Waste Management; Management Systems; Design Analysis; Structural Design

19980038354 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
An Evaluation of Contender Helmets for Visual Obstruction and Preliminary Validation of a Visual Obstruction Measuring Tool
Shek, Y., Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 31p; In English
Report No.(s): AD-A337436; DCIEM-97-R-64; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of this study was to (1) use a headform perimeter to evaluate contender army helmets for visual interference; and (2) determine the effectiveness and validity of using the headform perimeter to measure visual interference compared to using human subjects. A headform was made in-house to be used with a standard Goldmann perimeter. The head form perimeter was used to evaluate the six contender helmets for visual obstructions, by measuring loss of field of view (FOV). In a separate study, human subjects FOV measurements were obtained with the same Goldmann perimeter. Subjects' loss of FOV while wearing various helmets were measured. The results showed that: (1) all brimmed helmets caused significant reductions of FOV when

compared with baseline measurements (no helmet); (2) brimless helmets (British and Israeli) did not cause any significant reduction of FOV; and (3) the headform FOV data were consistent with subjects' FOV measurements, for three of the six test helmets.
DTIC
Human Factors Engineering; Helmets; Field of View

19980038365 Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada
An Evaluation of Workload Model Predictions in a Helicopter Environment
Cain, Brad, Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 71p; In English
Report No.(s): AD-A337570; DCIEM-97-R-66; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report compares the empirical workload results obtained during a field exercise involving four CH-136 Kiowa crews with results predicted from a task network simulation of the exercise. None of the correlation coefficients is outstanding and only a few of the analytical measures explained greater than 50% of the variance in the empirical workload scores. The correlations between the pilots' empirical workload scores and the analytical workload values were generally greater than that found for the observers, possibly a result of the smaller number of subjects in the observer group or perhaps reflecting greater attention focused on the workload of the pilot by the modeling community. The variation of the workload measures within each flight was substantial, suggesting individual differences between subjects as well as differences in the details of each mission played significant roles in determining the perception of workload rated by the subjects. of the overall workload measures, the simpler measures were found to capture the greatest portion of the empirical workload variance although these measures provide little detail in what is actually causing the overload and at best only capture 50% of the workload variance. While the multi-dimensional workload measures may provide greater detail about what is causing high workloads, they do not seem to be capturing a great deal of the workload variance to begin with. Although the correlations found in this study are low and only half the workload variance was captured, the models may still be useful.
DTIC
Evaluation; Helicopters; Workloads (Psychophysiology); Flight Training; Numerical Analysis

19980038367 Armstrong Lab., Wright-Patterson AFB, OH USA
Evaluation Method for Simulated Human Motion ***Interim Report, Jun. 1996 - Jan. 1997***
Wampler, Jeff L., Armstrong Lab., USA; Hale, Robert, Armstrong Lab., USA; Ziolek, Scon, Armstrong Lab., USA; Bridgman, Tom, Armstrong Lab., USA; Oct. 1997; 23p; In English
Contract(s)/Grant(s): AF Proj. 2940
Report No.(s): AD-A337582; AL/HR-TP-1997-0054; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computer generated human figures, called Human Figure Models (HFMs), are being used for human factors design and maintenance analysis on solid models of Department of Defense system designs. The reliability of products from HFM design analyses are dependent on the accuracy of the human model. This paper describes a method for evaluating the accuracy of an HFM compared to real human motion. Although the evaluation is being performed on the HFM in the Design Evaluation for Personnel, Training and Human Factors (DEPTH) system, the method can be applied to any commercially-available HFM.
DTIC
Evaluation; Human Factors Engineering; Computer Aided Design

19980040040 Air Force Inst. of Tech., Graduate School of Logistics and Acquisition, Wright-Patterson AFB, OH USA
USAF Pilot Perceptions of Workload Assessment in a Combat or High-Threat Environment
Kottas, Kadircan, Air Force Inst. of Tech., USA; Dec. 1997; 206p; In English
Report No.(s): AD-A335182; AFIT/GLM/LAC/97D-1; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This study analyzed the self reported survey responses of 219 Air Force Pilots concerning their perceptions of workload assessment in a combat or a high threat environment. The first objective of this study was to determine and compare the combat workload factors of varying importance in combat workload assessment by aircraft and mission type flown. The second objective was to examine the pilots' perception of combat mission inflight workload. A stepwise regression model to predict the pilots' perceptions of inflight workload using pilots' characteristics data was explored. Research conclusion varied among aircraft types. Combat workload items indicated as distractingly important were similar for all aircraft types, while items in lower level of importance were impacted by aircraft type. Mean Combat Workload (CWL) scores of pilots from each aircraft type were not significantly different. Overall, it was concluded that surveying pilots who had flown in combat or high threat environments provided

useful responses to assess pilot workload; however, findings based on subjective assessments, provide tentative grounds for further research.
DTIC
Aircraft Pilots; Combat; Workloads (Psychophysiology); Aeration

19980040041 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
A Physiological Evaluation of the Chemical, Biological Combat Suit under Warm, Humid and Hot, Dry Climatic Conditions
Amos, D., Defence Science and Technology Organisation, Australia; Gray, B., Defence Science and Technology Organisation, Australia; Hansen, R., Sydney Univ., Australia; Sep. 1997; 26p; In English
Report No.(s): AD-A335193; DSTO-TR-0570; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The physiological responses of a group of nine subjects exercising at a medium metabolic rate in a concept demonstrator low burden chemical protective ensemble have been determined under warm, humid and hot, dry climatic conditions typical of the Townsville and Pilbara regions of northern Australia. There was little difference between the normal combat uniform and the CBCS worn as a combat uniform, without hood, mask and gloves, in terms of increase in rectal temperature and increase in heart rate. The major limitation on soldier performance in the fully encapsulated Chemical, Biological Combat Suit was imposed by the combination of mask, permeable hood and impermeable gloves and not by the suit itself.
DTIC
Physiology; Evaluation; Combat; Suits; Protective Clothing; Physiological Effects; Performance Prediction

19980040045 Hudson Research Associates, Stuyvesant, NY USA
Computer Aided Systems Human Engineering: Performance Visualization System. A Hypermedia Tool for Designers ***Interim Report, Jan. 1990 - Nov. 1996***
Lincoln, Janet E., Hudson Research Associates, USA; Monk, Donald l., Hudson Research Associates, USA; Aug. 1997; 210p; In English
Contract(s)/Grant(s): F41624-94-D-6000; AF Proj. 7184
Report No.(s): AD-A335217; AL/CF-TR-1997-0149; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
The Computer Aided Systems Human Engineering: Performance Visualization Subsystem (CASHE:PVS) is a multidocument ergonomics database on CD-ROM. The reference documents in the database provide data, phenomenon descriptions, models, and standards' from over 70 research areas dealing with the perceptual and performance capabilities of the human operator. This information is integrated into an interactive multimedia system that combines state of the art information retrieval, browsing, and navigation with specialized tools that help the designer interpret and apply the ergonomics data available in the product. Behavioral data and phenomena descriptions in text, figures, and tables are accompanied by prototyping simulations, animations, and audio demonstrations that allow users to experience important perceptual and performance phenomena for themselves and provide a rich understanding of how these phenomena relate to the design of human-operated systems. This report provides a system overview of the software and gives detailed discussions of various design and implementation issues associated with the production of the software and its databases.
DTIC
Computer Aided Design; Human Factors Engineering; Data Bases; Systems Engineering; Display Devices

19980040078 Natick Research, Development and Engineering Center, Army Soldier Systems Command, Natick, MA USA
Candidate Fabrics for the 2nd Generation Extended Cold Weather Clothing System ***Final Report***
Auerbach, Margaret A., Natick Research, Development and Engineering Center, USA; Jugueta, Regina D., Natick Research, Development and Engineering Center, USA; Dec. 1997; 50p; In English
Contract(s)/Grant(s): DAAK60-95-P-9059
Report No.(s): AD-A336776; NATICK/TR-98-006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A literature search was conducted during the summer of 1995 to find potential candidate fabrics and materials for the 2nd Generation Extended Cold Weather Clothing System (ECWCS). The objective was to find alternative materials for the ECWCS which would drastically reduce the weight and bulk of the current system, while providing improved environmental protection over a wide spectrum of climatic conditions. Several materials were identified that showed potential; however, materials testing is needed before a complete evaluation of the materials can be made.
DTIC
Protective Clothing; Cold Weather

19980040089 Department of the Navy, Washington, DC USA

Breathing Gas Cooling and Heating Device

Hughes, Robert, Inventor, Department of the Navy, USA; Courson, Billy, Inventor, Department of the Navy, USA; Rudolph, Joseph, Inventor, Department of the Navy, USA; Sep. 02, 1997; 5p; In English

Patent Info.: Filed 10 Aug. 1995; US-Patent-Appl-SN-513-493; US-Patent-5,662,161

Report No.(s): AD-D018720; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A breathing gas cooling and heating device. Warm breathing gas enters the unit which consists of a heat exchanger mounted in an insulated shell and runs through the heat exchanger tubes. These tubes are in intimate thermal contact with micro-encapsulated phase change materials. The micro-encapsulated phase change material changes phase from solid to liquid, thereby absorbing heat at the temperature of the phase change material, and thereby cooling the gas flowing through the heat exchanger. In situations where heating of the breathing gas is desired, the gas stream absorbs heat from the phase change material. The unit is rechargeable for chilling applications after usage by placing the device in an ambient environment less than the temperature of the phase change of the material or by replacing the phase change material. It is rechargeable for heating applications by warming the device to a temperature above that of the phase change material. The unit circum vents the need for ice, the most commonly available chilling medium, in situations where ice or other cooling is not available. Additionally, the unit can be used by filling it with an ice water slurry for fire fighting applications where ice is readily available. The gas then exits the device in a chilled state. The device is designed to work in conjunction with numerous existing breathing apparatus by virtue of the in-line installation capability to existing systems.

DTIC

Breathing Apparatus; Gas Heating; Gas Cooling; Heat Exchangers; Gas Flow

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.

19980037023 California Univ., Dept. of Electrical Engineering and Computer Sciences, Berkeley, CA USA

Supplement to Exploiting Chaos in Oversampled A/D Converters ***Final Report, 15 Jun. 1994 - 14 Jun. 1997***

Zakhor, Avideh, California Univ., USA; Jun. 1997; 17p; In English

Contract(s)/Grant(s): F49620-94-I-0359

Report No.(s): AD-A335687; AFRL-SR-BL-TR-98-0092; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The grant supported work in three dimensional image representation and reconstruction. Multilevel information is combined to enable effective representation of shading and occlusion. The modeling process fits in well with CCD camera array sensing, and multichannel sampling permits improved motion estimates between frames in a video sequence. The usual redundancy in 3-D scene representation can be shown to allow meaningful exploitation by encoding the redundant distance, depth and intensity parameters. Significant performance improvements were demonstrated over usual bilinear and cubic B-spline algorithms.

DTIC

Chaos; Cubes (Mathematics); Exploitation; Image Reconstruction; Spline Functions

19980041210 Rome Air Development Center, Griffiss AFB, NY USA

Evaluation of the Larch/VHDL Interactive Prover in Hardware Verification

Paragi, Robert J., Rome Air Development Center, USA; Nassif, Michael P., Rome Air Development Center, USA; Stabler, Edward P., Rome Air Development Center, USA; Oct. 1997; 42p; In English

Contract(s)/Grant(s): Proj. 2338

Report No.(s): AD-A337948; RL-TR-97-123; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report concludes an in-house evaluation of the Larch/VHDL hardware design verification tool. The evaluation is part of a larger activity to transition Larch/VHDL from a research phase to application usage within universities and industry. The Larch/VHDL tool environment has been developed by Odyssey Research Associates (ORA) under a contract with Rome Laboratory that combines a specification language, Larch, with a widely used hardware design language, VHSIC Hardware Description Language (VHDL). These two notations provide a highly structured input to the third major component of the tool environment, the Penelope theorem prover, also developed by ORA under Rome Laboratory contract. In conjunction with traditional hardware design simulation, the theorem prover provides a compact methodology for verifying correctness of a design which otherwise

would be computationally unfeasible with simulation alone. The evaluation has shown that significant portions of completed verification work on one portion of a design can be reused for proving correctness of other portions of the design.
DTIC
Evaluation; VHSIC (Circuits); Hardware Description Languages; Proving; Computer Aided Design; Program Verification (Computers)

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

19980037234 California Univ., Coll. of Engineering, Riverside, CA USA
Multistrategy Learning for Computer Vision ***Final Report, 1 Jul. 1995 - 31 Dec. 1996***
Bhanu, Bir, California Univ., USA; Mar. 31, 1997; 172p; In English
Contract(s)/Grant(s): F49620-95-I-0424
Report No.(s): AD-A335681; AFRL-SR-BL-TR-98-0085; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Current IU algorithms and systems lack the robustness to successfully process imagery acquired under real-world scenario. They do not provide the necessary consistency, reliability and predictability of results. Robust 3-D object recognition, in practical applications, remains one of the important but elusive goals of IU research. With the goal of achieving robustness, our research at UCR is directed towards learning parameters, feedback, contexts, features, concepts, and strategies of IU algorithms for model-based object recognition. Our multistrategy learning-based approach is to selectively apply machine learning techniques at multiple levels to achieve robust recognition performance. At each level, appropriate evaluation criteria are employed to monitor the performance and self-improvement of the system. We developed theoretically sound approaches to recognition and to learn segmentation for robust model-based recognition. We have developed two approaches based on reinforcement learning for closed-loop object recognition in a multi-level vision system. We show that in simple real scenes with varying environmental conditions and camera motion, effective low-level image analysis and feature extraction can be performed. We show the performance improvement of an IU system combined with learning over an IU system with no learning. Our initial research using outdoor video imagery and the Phoenix algorithm has demonstrated that (a) adaptive image segmentation can provide over 30 improvement in performance, as measured by the quality of segmentation, over non-adaptive techniques, and (b) learning from experience can be used to improve the performance over time. We have developed some novel techniques and we have some results for context reinforced ATR using learning techniques. These results have yet to be validated on a larger dataset.
DTIC
Computer Vision; Machine Learning; Robustness (Mathematics); Pattern Recognition; Imaging Techniques; Feedback Control

19980037237 Massachusetts Inst. of Tech., Dept. of Mechanical Engineering, Cambridge, MA USA
New Concepts in Computer Simulation-Surrogates ***Final Report, 1 Jan. 1994 - 31 Dec. 1996***
Patera, Anthony T., Massachusetts Inst. of Tech., USA; Feb. 03, 1997; 5p; In English
Contract(s)/Grant(s): F49620-94-I-0121
Report No.(s): AD-A335679; AFRL-SR-BL-TR-98-0118; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Although the advent of fast and inexpensive parallel computers has rendered numerous previously intractable calculations feasible, many numerical simulations remain too resource intensive to be directly inserted into engineering optimization efforts. An alternative to direct insertion considers models for computational systems: the expensive simulation is evoked only to construct and validate a simplified input output model; this simplified input output model then serves as a simulation surrogate in subsequent engineering optimization studies. As compared to the direct insertion approach, surrogates offer more complete, efficient, and robust optimization, greater accommodation of prior information, broad applicability to families of objective functions, and a more interactive, flexible design environment. In this project, a validated surrogate methodology was developed which permits economical and reliable integration of large-scale, possibly noisy numerical simulations into engineering design and optimization studies. The project included both the formulation, analysis, and implementation of construction-validations algorithms, and the application of the resulting techniques to problems of scientific and engineering interest. The sample application are intended to be sufficiently simple to permit numerical experiment, yet sufficiently complex to properly stimulate, constrain, and demonstrate the proposed methodology.
DTIC
Computerized Simulation; Design Analysis; Optimization; Parallel Computers

19980037436 Jet Propulsion Lab., California Inst. of Tech., Wrightwood, CA USA

Soft-Output Decoding Algorithms in Iterative Decoding of Turbo Codes

Benedetto, S., Politecnico di Torino, Italy; Montorsi, G., Politecnico di Torino, Italy; Divsalar, D., Jet Propulsion Lab., California Inst. of Tech., USA; Pollara, F., Jet Propulsion Lab., California Inst. of Tech., USA; The Telecommunications and Data Acquisition Report; Feb. 15, 1996, pp. 63-87; In English; Also announced as 19980037430

Contract(s)/Grant(s): NATO-CRG-951208; RTOP 315-91-20-20-53; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

In this article, we present two versions of a simplified maximum a posteriori decoding algorithm. The algorithms work in a sliding window form, like the Viterbi algorithm, and can thus be used to decode continuously transmitted sequences obtained by parallel concatenated codes, without requiring code trellis termination. A heuristic explanation is also given of how to embed the maximum a posteriori algorithms into the iterative decoding of parallel concatenated codes (turbo codes). The performances of the two algorithms are compared on the basis of a powerful rate 1/3 parallel concatenated code. Basic circuits to implement the simplified a posteriori decoding algorithm using lookup tables, and two further approximations (linear and threshold), with a very small penalty, to eliminate the need for lookup tables are proposed.
Author

Algorithms; Signal Processing; Data Transmission; Digital Systems; Satellite Transmission; Concatenated Codes; Decoding; Heuristic Methods

19980037595 Argonne National Lab., Environmental Assessment and Information Sciences Div., IL USA

Analytical Model for Radial Injection of NORM with a Step-Function Source

Williams, Gustavious Paul, Argonne National Lab., USA; Tomasko, David, Argonne National Lab., USA; Smith, Karen, Argonne National Lab., USA; Blunt, Deborah, Argonne National Lab., USA; Sep. 1997; 15p; In English; International Petroleum Environmental Conference, 9-12 Sep. 1997, San Antonio, TX, USA

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): AD-A335393; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents information on a model used to analyze the underground injection of wastes containing naturally occurring radioactive material (NORM). This model uses a step function contaminant source, which models intermittent NORM injection in a continuous brine injection well. The governing equations are presented and transformed into Laplace space, where the equations are solved. The numerical inversion of this solution is detailed. The model is cast in a nondimensional form such that a single model solution is valid for a large number of different field conditions. This paper also presents a case study that compares this analytical model to a simple mixing model for a field demonstration site in west Texas. This case study showed that at distances of more than 100 meters from the injection well, calculated subsurface NORM activities were lower than proposed U.S. Environmental Protection Agency drinking water standards. The comparison also shows that the simple mixing model overpredicts activity levels close to the injection well and underpredicts activities further from the well.
DTIC

Waste Management; Mathematical Models; Laplace Transformation; Radioactive Wastes

19980037607 Xtensory, Inc., Scotts Valley, CA USA

Enhanced Virtual Presence for Immersive Visualization of Complex Situations for Mission Rehearsal *Final Report, Sep. 1986 - Aug. 1987*

Cutt, Paul, Xtensory, Inc., USA; Jun. 1997; 67p; In English

Contract(s)/Grant(s): DASW01-96-C-0046

Report No.(s): AD-A336568; ARI-RN-97-16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This final report describes the key requirements of an internet-based system that provides an immersive environment for mission rehearsal. It shows how off-the-shelf hardware and software can be used to meet those requirements. A layering implementation technique is used with the common hardware and software to provide economies of scale both in the use of new hardware/software and functionality. Finally specific hardware/software is described where necessary to provide support for mission rehearsal. In particular new inventions such as the Internet Appliance and Remote Access Controller are described in detail together with their implementation.
DTIC

Virtual Reality; Computer Programs; Military Operations; Display Devices; Education

19980037625 Defence Science and Technology Organisation, Canberra, Australia

Software Instrument Control Suite

Clarke, David, Defence Science and Technology Organisation, Australia; Oct. 1997; 33p; In English

Report No.(s): AD-A335301; DSTO-GD-0156; DODA-AR-010-355; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of computers to control instrumentation can provide improvements in quality, quantity and turn around time of work carried out by a laboratory. These improvements must be balanced against the time taken to write the programs that control the instruments. This work documents a library of instrument control routines used to facilitate the task of programming and to enable the full advantage of computer controlled instrumentation to be realised.

DTIC

Numerical Control; Computers; Libraries; Software Engineering; Object-Oriented Programming

19980037650 Naval Postgraduate School, Monterey, CA USA

Decomposition Recovery Extension to the Computer Aided Prototyping System (CAPS) Change-Merge Tool

Keesling, William Ronald, Naval Postgraduate School, USA; Sep. 1997; 203p; In English

Report No.(s): AD-A337883; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

A promising use of Computer Aided Prototyping System (CAPS) is to support concurrent design. Key to success in this context is the ability to automatically and reliably combine and integrate the prototypes produced in concurrent efforts. Thus, to be of practical use in this as well as most prototyping contexts, a CAPS tool must have a fast, automated, reliable prototype integration capability. The current CAPS Change Merge Tool is fast, automated, and uses a highly reliable formalized semantics based change merging method to integrate, or change merge, prototypes which are written in Prototype System Description Language (PSDL). This method can guarantee correct merges, but it loses the prototype's design decomposition structure in the process. The post merge prototype is fully functional, but the design decomposition structure vital to prototype understandability must be manually recovered before post merge prototyping can continue. The delay incurred is unacceptable in a rapid prototyping context. This thesis presents a software design and Ada implementation for a formalized algorithm which extends the current CAPS Change Merge Tool to automatically and reliably recover a merged prototype's design decomposition structure. The algorithm is based in formal theoretical approaches to software change merging and includes a method to automatically report and resolve structural merge conflicts. With this extension to the Change Merge Tool, CAPS prototyping efforts, concurrent or otherwise, can continue post merge with little or no delay.

DTIC

Decomposition; Computer Techniques; Software Engineering; Computer Aided Design; Recoverability

19980037678 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

Measures of the Discriminability of Symbol Shapes

McFadden, Sharon, Defence and Civil Inst. of Environmental Medicine, Canada; Bauer, Ben, Defence and Civil Inst. of Environmental Medicine, Canada; McManus, Kelly, Defence and Civil Inst. of Environmental Medicine, Canada; Dec. 1997; 41p; In English

Report No.(s): AD-A335270; DCIEM-97-R-61; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Participants rated the similarity of 90 pairs of symbols based upon ten geometric shapes. The discriminability of these shapes was then examined in a visual search task where participants enumerated the number of occurrences of a particular target shape found in a display of distractors. The results were submitted to correlation analysis and MultiDimensional Scaling (MDS) analysis to examine the relationship between the similarity ratings and the visual search task. Based on the correlation analysis, subjective assessment can predict when two symbols will be highly discriminable. However in some cases, symbols rated as similar proved highly discriminable. The results of the multidimensional scaling analysis suggested that, in the similarity rating task, participants differentiated the symbols primarily on their overall geometric shape. However in the visual search task, participants appeared to use other dimensions such as vertical height and symmetry in discriminating the symbols. These findings in conjunction with the results of other researchers suggest that context and task both may influence the features used in discriminating symbols. Suggestions are made for additional research that would evaluate the relevance of these two factors more thoroughly.

DTIC

Discrimination; Computer Graphics; Visual Perception; Visual Tasks

19980037832 Air Force Academy, Dept. of Mathematics, CO USA

Mathematical Software Evaluation Report: Mathcad Plus 6.0 versus Mathematica 3.0 ***Final Report***

Hadfield, Steven M., Air Force Academy, USA; Crockett, Carl, Air Force Academy, USA; Simonich, Paul J., Air Force Academy,

USA; Mcharg, Matthew G., Air Force Academy, USA; Mandeville, William J., Air Force Academy, USA; Nov. 10, 1997; 164p; In English
Report No.(s): AD-A337847; USAFA-TR-97-10; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

In early 1997, the Department of Mathematical Sciences at the United States Air Force Academy conducted an evaluation to determine whether to migrate from Mathematica 2.2 to Mathematica 3.0 or to switch to Mathcad Plus 6.0 which was being successfully used by the Department of Physics. A 38 members team evaluated the suitability of both software packages in terms of user friendliness and functionality using sample problems taken from Precalculus, Calculus 1, 2, and 3, Differential Equations, and Engineering Mathematics as well as some advanced physics courses. This technical report is a comprehensive documentation of this evaluation describing the methodology, findings, and conclusions of this evaluation. In the end, the Department of Mathematical Sciences choose to migrate to Mathematica 3.0 due primarily to superior functionality, while the Department of Physics found that Mathcad Plus 6.0 met all of their needs and was easier to use by their students.
DTIC
Software Engineering; Program Verification (Computers)

19980037934 Naval Postgraduate School, Monterey, CA USA
Prototype for Enhancement of ANVIS/HUD CBT Instruction Through Use of Embedded Visual Simulation
Foggin, G. Thomas, Naval Postgraduate School, USA; ORourke, Paul J., Naval Postgraduate School, USA; Sep. 1997; 94p; In English
Report No.(s): AD-A337897; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this project is to develop a computer based trainer (CBT) for ANVIS/HUD that takes advantage of recent advances in multimedia technology. Integration of a head mounted display (HMD) into the CBT system allows the user to be immersed into a virtual world that simulates actual NVG use. In accordance with guidelines established by Ciavarelli, Baer and Sengupta, in their NVG Training Technology Report, December 1994, for the Naval Aviation Systems Command (PMA 205) and using Macromedia Director 6.0, it is possible to incorporate a synthesized continuous multimedia data base into a system that permits user interaction along a scripted NVG flight path. The system has the capability of demonstrating some of the capabilities and limitations of an actual ANVIS/HUD system under user selectable lighting and terrain features. By utilizing commercial off the shelf (COTS) software and hardware the system represents a possible low cost, personal computer (PC) based, ANVIS/HUD trainer.
DTIC
Computer Assisted Instruction; Head-Up Displays; Night Vision

19980037959 Massachusetts Inst. of Tech., Cambridge, MA USA
Applications of the Theory of Distributed and Real Time Systems to the Development of Large- Scale Timing Based Systems ***Progress Report, 1 Oct. - 12 Dec. 1997***
Lynch, Nancy, Massachusetts Inst. of Tech., USA; Dec. 1997; 11p; In English
Contract(s)/Grant(s): F19628-95-C-0118
Report No.(s): AD-A336406; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We continued our project on the IOA language and toolset, which are designed to support our formal approach to distributed system design and analysis. The design of the IOA language is substantially complete, and appears in a language manual on the web. This quarter, work continued on the development of tools for the IOA language; our toolset will include a parser and static semantic checker, composition routine, support for levels of abstraction interfaces with theorem provers and model checkers, a simulator, and a code generator for real distributed code.
DTIC
Programming Languages; Time Measurement; Timing Devices; Real Time Operation

19980038195 Odyssey Research Associates, Inc., Ithaca, NY USA
The THETA (Trusted Heterogenous Architecture System), 2.2 ***Final Report, Jul. 1992 - Dec. 1995***
Hartman, Bret, Odyssey Research Associates, Inc., USA; Barbasch, Cheryl, Odyssey Research Associates, Inc., USA; Stillerman, Matthew, Odyssey Research Associates, Inc., USA; Pascale, Rita, Odyssey Research Associates, Inc., USA; McEnerney, Joseph, Odyssey Research Associates, Inc., USA; Sep. 1997; 120p; In English
Contract(s)/Grant(s): F30602-92-C-0145; AF Proj. 7820
Report No.(s): AD-A336729; ORA-TM-95-0023; RL-TR-97-95; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report is intended for people who wish to acquire a general conceptual overview of the THETA system and the technical advancements that resulted from the research. The report defines the terminology and the basics of secure, distributed, object ori-

ented environments. Programming for the THETA system, administration, usage, and other related information is provided in other contract deliverables listed in this report. Chapter 1 contains an introduction to THETA, explaining its security philosophy, architecture, and implementation. Chapter 2 provides a comparison of THETA and CORBA, and discusses the potential for a CORBA compliant version of THETA. Chapter 3 compares THETA and DCE, and explores approaches to integration. Chapter 4 presents a list of the accomplishments of the THETA project. Lessons learned from this effort are presented in Chapter 5. Possibilities for future THETA development are outlined in Chapter 6.
DTIC
Distributed Processing; Object-Oriented Programming; Architecture (Computers)

19980038205 Syracuse Univ., NY USA
DIAMONDS: Engineering Distributed Object Systems ***Final Report, Apr. - Jun. 1995***
Cheng, Evan, Syracuse Univ., USA; Craig, Gary, Syracuse Univ., USA; Nagaratnam, Nataraj, Syracuse Univ., USA; Srinivasen, Arvind, Syracuse Univ., USA; Tsai, Jo, Syracuse Univ., USA; Oct. 1997; 68p; In English
Contract(s)/Grant(s): F30602-95-C-0130; AF Proj. 2530
Report No.(s): AD-A336737; RL-TR-91-144; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report describes DIAMONDS, a research project at Syracuse University, that is dedicated to producing both a methodology and corresponding tools to assist in the development of heterogeneous distributed software. The design is based on cooperative fine grained objects and a concrete design notation, odl. The mapping of the design and programming model to the run time computational model incrementally composes tightly coupled objects into coarse grained abstractions. The resulting software development process supports continuity from the abstract analysis and design to the concrete implementation and postpones concerns on encapsulation and structure as dictated by the application and/or the problem domain. The report also describes additional support added to DIAMONDS in order to support reliability and resource management.
DTIC
Resources Management; Distributed Processing; Object-Oriented Programming

19980038236 General Accounting Office, Washington, DC USA
Year 2000 Computing Crisis: FAA Must Act Quickly to Prevent Systems Failures
Feb. 04, 1998; 11p; In English
Report No.(s): AD-A337164; GAO/T-AIMD-98-63; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We appreciate the opportunity to testify on the Federal Aviation Administration's (FAA) efforts to address the Year 2000 problem a situation in which systems could malfunction or fail because the '00,' in the year 2000 may be indistinguishable from the '00,' in 1900 unless these systems are modified or replaced. With only 696 days remaining until January 1, 2000, federal agencies must act now to ensure that critical systems continue to operate. T here may be no more urgent federal information systems priority. Hundreds of critical FAA computer systems make its operations possible; without these specialized systems, FAA could not effectively control air traffic, target airlines for inspection, or provide up to date weather conditions to pilots and air traffic controllers. However, many of these systems could fail to perform as needed when using dates after 1999, unless proper date related calculations can be assured. The implications of FAA's not meeting this immovable deadline are enormous and could affect hundreds of thousands of people through customer inconvenience, increased airline costs, grounded or delayed flights, or degraded levels of safety.
DTIC
Software Engineering; Computers; Costs; Information Systems; Safety; Management Planning

19980038239 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA
A Tracker for Broken and Closely-Spaced Lines
Chiba, Naoki, Carnegie-Mellon Univ., USA; Kanade, Takeo, Carnegie-Mellon Univ., USA; Oct. 1997; 18p; In English
Contract(s)/Grant(s): DAAH04-94-G -0006
Report No.(s): AD-A336504; CMU-CS-97-182; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We propose an automatic line tracking method which can deal with broken or closely-spaced line segments more accurately than previous methods over an image sequence. The method uses both grey scale information of the original images and geometric attributes of line segments. by using our hierarchical optical flow technique, we can get a good prediction of line segments in a consecutive frame even with large motion. The line attribute of direction, not the orientation, discriminates closely-spaced line segments because when lines are crowded or closely-spaced, their directions are opposite in many cases, even though their orientations are the same. A proposed new matching cost function enables us to deal with multiple collinear line segment matching easily

instead of using one-to-one matching. Experiments using real image sequences taken by a hand-held camcorder show that our method is robust against line extraction problems, closely-spaced lines, and large motion.
DTIC
Image Processing; Collinearity

19980038258 Princeton Univ., Dept. of Psychology, NJ USA
Causal Models in the Acquisition and Instruction of Programming Skills
Reiser, Brian J., Princeton Univ., USA; Aug. 1997; 42p; In English
Contract(s)/Grant(s): MDA903-87-K-0652; Proj. B74F
Report No.(s): AD-A336259; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research project investigated how an interactive learning environment can support students' learning and acquisition of mental models when acquiring a target cognitive skill. In this project, we have constructed GIL, an intelligent tutoring system for LISP programming, and have used GIL to conduct pedagogical experiments on skill acquisition. We have studied two ways in which an interactive learning environment can facilitate students' acquisition of novel complex domains. The first set of studies examines how graphical representations provide a representation more congruent with students' reasoning. A second set of studies examines how explanatory feedback, generated from the system's problem solving knowledge, can facilitate students' learning. The experiments demonstrate computer-based support during learning can help students construct a more effective model for reasoning in complex domains.
DTIC
Models; Acquisition; Computer Techniques; Computer Programming

19980038260 California Univ., Dept. of Psychology, Los Angeles, CA USA
A Cognitive Architecture for Solving ill-Structured Problems ***Final Report, Sep. 1986 - Aug. 1987***
Holyoak, Keith J., California Univ., USA; Thagard, Paul, Princeton Univ., USA; Aug. 1997; 16p; In English
Contract(s)/Grant(s): MDA903-86-K-0297
Report No.(s): AD-A336505; ARI-RN-97-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational theory of analogical mapping is described, based on a set of constraints. The theory is embodied in a computer simulation that is applied to several examples, including psychological data on the mapping process.
DTIC
Parallel Processing (Computers); Machine Learning; Problem Solving

19980038339 Naval Postgraduate School, Monterey, CA USA
Classification, Search, and Retrieval in a Multi-Variable, Multi-Level Taxonomy: Application to DecisionNet
Corgnati, Christopher M., Naval Postgraduate School, USA; Sep. 1997; 166p; In English
Report No.(s): AD-A337498; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The explosion of information available on global computer networks underlines the need for effective repositories that facilitate organization of, and search for, information. These digital repositories may contain simple data, or increasingly, objects of other types such as software and decision models. A taxonomy can be thought of as a navigational aid to a repository. Organization of objects may take place along multiple dimensions, each of which may have a taxonomy of classification terms that spans many levels. This thesis examines the design and development of a WWW based Classification, Registration, Search, and Retrieval System. The system was applied and tested on the DecisionNet project which is an electronic brokerage house for decision technologies. In order to facilitate user interaction via the WWW the system was designed to be run through a standard web browser. A graphical user interface was developed in Java. The back-end functions for data management, search and retrieval were also programmed largely in Java.
DTIC
Information Retrieval; Decision Support Systems; Data Bases

19980038342 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Department of Computer Science, ***1 Jan. - 31 Dec. 1996***
Lewis, Theodore G., Naval Postgraduate School, USA; Rowe, Neil C., Naval Postgraduate School, USA; Nov. 1997; 89p; In English
Report No.(s): AD-A337510; NPS-09-97-004; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report contains summaries of research projects in the Department of Computer Science. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical ports, and thesis abstracts.
DTIC
Research Projects; Computer Programming; Software Engineering

19980038352 Signition, Inc., Espanola, NM USA
Adaptive Compression of Images
Dec. 14, 1996; 17p; In English
Contract(s)/Grant(s): N00014-96-C-6007
Report No.(s): AD-A336701; NRL-97-0001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We propose an adaptive compression enhancement scheme for images, that faithfully preserves edges that exist at certain scales. The image gradient is decomposed in a wavelet basis to locate edges at specific scales. Based on their location, the corresponding wavelet coefficients in the wavelet decomposition of the image are earmarked for preservation. A scale-space localized implementation of the gradient operator is derived in the wavelet transform domain, based on the Lemarie-Rieusset diagonalization of the derivative operator for functions of one variable. by decomposing an image with respect to a standard biorthogonal wavelet basis, we succeed in obtaining the gradient (edge) information in the image (with respect to associated hybrid biorthogonal wavelet bases) at certain desired scales only. There are several advantages to and applications of such a localized implementation of the gradient, apart from its computational efficiency. Adaptive compression of images based on edge-strengths at specific scales becomes possible, so that compression can be less in the neighborhood of edges at those scales at which its characteristics are best represented. Such preferential compression capability is useful for the compression of vast databases of oceanographic and astronomical images; faint edges characterizing interfaces between warm and cold ocean currents in satellite oceanographic images, and boundaries between interstellar dust and nebulae of subtly varying luminosities in astronomical images are important image features that need to be preserved with minimum distortion, while achieving significant compression in other parts of these images that correspond to known features such as land-ocean boundaries or familiar stars.
DTIC
Image Processing; Satellite Imagery; Wavelet Analysis; Adaptive Control

19980040937 Georgia Inst. of Tech., Coll. of Computing, Atlanta, GA USA
Designing an Interactive Multimedia Environment for Learning and Aiding Troubleshooting ***Final Report, Jun. 1990 - Sep. 1994***
Kolodner, Janet, Georgia Inst. of Tech., USA; Recker, Mimi, Georgia Inst. of Tech., USA; Sep. 1997; 62p; In English
Contract(s)/Grant(s): MDA903-90-K-0112; B74F61102C06
Report No.(s): AD-A337686; ARI-97-39; ARI-RN-97-39; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The need for effective troubleshooting is rapidly becoming ubiquitous in our increasingly technological society. However troubleshooting is a complex process both to learn and perform. This report examines the prospects for designing an interactive learning environment that helps users acquire and engage in effective troubleshooting. This work is informed by two important strands of related research. First, we draw upon research focused on the design and development of interactive learning environments. We are interested both in work focusing on theory driven design on multimedia, and work focusing on how students learn in apprenticeship learning situations. The research summarized forms the basis for a prototype design of an interactive multimedia environment. The prototype is designed for the task domain of help desk troubleshooting of computer systems problems for a large computer company.
DTIC
Transfer of Training; Computers; Multimedia

19980040971 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Department of Electrical and Computer Engineering, ***1 Jan. - 31 Dec. 1996***
Loomis, Herschel H., Jr., Naval Postgraduate School, USA; Knorr, Jeffrey B., Naval Postgraduate School, USA; Nov. 1997; 117p; In English
Report No.(s): AD-A337986; NPS-09-97-005; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report contains summaries of research projects in the Department of Electrical and Computer Engineering. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts.
DTIC
Electrical Engineering; Antenna Arrays; Integrated Circuits; Signal Processing

19980040976 Stanford Univ., Dept. of Mechanical Engineering, Stanford, CA USA
Formulation and Analysis of Stable Time-Stepping Algorithms for Contact Problems ***Final Report, 1 Oct. 1992 - 30 Sep. 1997***
Petocz, Eva G., Stanford Univ., USA; Jan. 1998; 148p; In English
Contract(s)/Grant(s): F49620-92-J-0543; F49620-97-I-0196
Report No.(s): AD-A336872; SUDMC-98-02; AFRL-SR-BL-TR-98-0155; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The formulation of stable time-stepping algorithms for dynamic contact problems, both frictionless and frictional, is presented. Special attention is given to the properties of the underlying continuum problem to serve as guidelines for the development of the algorithms. The proposed method conserves linear and angular momenta, and, in the frictionless case, conserves the energy by means of a restoration potential. Coulomb's friction law is used to model the friction phenomenon; the scheme presented herein is unconditionally dissipative, just as the physical system is. The scheme has been enhanced by the enforcement of a constraint on the velocities, in addition to the unilateral (impenetrability) constraint imposed on the displacements; this enhancement does not disturb the conservation/restoration properties. Numerical dissipation may also be added to stabilize the scheme for problems with high frequency energy modes. A multibody implementation is presented to show the versatility of the algorithm. In this implementation, the contract detection scheme includes an efficient sorting procedure which makes large scale simulations possible. Lastly, various numerical examples show the stability and robustness of the scheme.
DTIC
Friction; Finite Element Method; Algorithms

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COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

19980037608 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA
Modeling and Interpreting Multimodal Inputs: A Semantic Integration Approach
Vo, Minh T., Carnegie-Mellon Univ., USA; Waibel, Alex, Carnegie-Mellon Univ., USA; Dec. 1997; 22p; In English
Contract(s)/Grant(s): N00014-93-I-0806
Report No.(s): AD-A336561; CMU-CS-97-192; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Modern user interfaces can take advantage of multiple input modalities such as speech, gestures, handwriting... to increase robustness and flexibility. The construction of such multimodal interfaces would be greatly facilitated by a unified framework that provides methods to characterize and interpret multimodal inputs. In this paper we describe a semantic model and a multimodal grammar structure for a broad class of multimodal applications. We also present a set of grammar-based Java tools that facilitate the construction of multimodal input processing modules, including a connectionist network for multimodal semantic integration.
DTIC
Modules; Robustness (Mathematics); Speech Recognition

19980037701 Charles River Analytics, Inc., Cambridge, MA USA
Agent-Enhanced Electronic Classroom on the Web ***Final Report, 13 Sep. 1996 - 27 May 1997***
Mazzu, James M., Charles River Analytics, Inc., USA; Deluca, Alfred J., Massachusetts Univ., USA; Seadia, Joshua, Charles River Analytics, Inc., USA; Das, Subrata K., Charles River Analytics, Inc., USA; Sep. 1997; 66p; In English
Contract(s)/Grant(s): DASW01-96-6-0070
Report No.(s): AD-A336085; CRA-R-96291; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents an effort to develop a prototype Agent Enhanced Electronic Classroom (eClass) that uses intelligent agents as tutors and coaches. In this Phase 1 project, we worked alongside the UMass Dartmouth Division of Continuing Education to investigate an electronic classroom architecture which will complement the training objectives of the Five Pillars of the WF

XXI Campaign. The architecture developed incorporates intelligent software agent technology capable of personalizing course content to each student. The eClass prototype was completed during this Phase 1 effort, and is available through the web at http://agents.cra.com/eclas. The selected training content for the prototype involves learning how to interpret aviation weather reports. The eClass Agent allows students to navigate through course content (a coded weather report), bringing the student quizzes and exams when the student has reviewed the corresponding material. The agent corrects the exams and coaches the student through additional material. Evaluation of the prototype eClass was conducted primarily at the Eastern Aviation Army National Guard Training Site in Ft. Indiantown Gap, Pennsylvania. The Phase 1 prototype can easily be customized for any number of web based training materials providing a high commercial potential.
DTIC
Education; Computer Conferencing; Computer Aided Design

19980038196 Naval Postgraduate School, Monterey, CA USA
Quality Network Load Information Improves Performance of Adaptive Applications
Kresho, John p., Naval Postgraduate School, USA; Sep. 1997; 185p; In English
Report No.(s): AD-A336727; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The Joint Task Force Reference Architecture requires a Commas Server to aid client applications in adapting to changing network loads by apprising them of current and expected loads. The current Commas Server implementation estimates the network load by sending various sized packets and reporting raw performance statistics to the client. This implementation presents three problems: (1) clients interpret the statistics autonomously, (2) statistics are inaccurate due to the instantaneous collection procedure, and (3) clients also require the state of other resources to make informed decisions concerning adaptation. Development of a new Commas Server design, which solves these problems, is needed. This thesis develops a new Commas Server design and determines, through simulation, whether providing a more accurate estimate of the load could permit users of adaptive applications to obtain better performance. Simulations were run using many different situational parameters. Both the average size of the data successfully transmitted, and whether an application met its deadline, were recorded. The results of these simulations show that clients of the existing Commas Server perform much better because they adapt, but in some cases 14% to 30% of the messages do not arrive by their deadline. However, a better design that more accurately estimates loads could deliver at least 96% of the messages on time.
DTIC
Computer Programs; Architecture (Computers); Computer Networks

19980038232 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
Message-Bundle Converting in Internet Protocol Multicast-Based High Level Architecture Exercises
Bobo, Tracy A., Air Force Inst. of Tech., USA; Dec. 1997; 113p; In English
Report No.(s): AD-A336507; AFIT/GCS/ENG/97D-20; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Department of Defense is pushing for more wide-spread and realistic interactive training simulations which increases the demand on network capacity and resources. While network bandwidth is a measurable resource, packet bandwidth, or the number of packets-per-second (Pk/s) a host can handle, is a shifting commodity. This research analyzes host performance characteristics under varying data loads. The hosts include SGI single and multi-processor systems and Intel Pentium platforms using both Windows 95 and Linux Operating Systems. The networking media covers Ethernet, ATM and FDDI. For the ATM network, both AAL5 and IP over ATM were analyzed. With the data from this research, a system is proposed and developed that takes individual messages and bundles them into multi-message packets. This bundling process overcomes the 5,000 Pk/s limitation, reduces the CPU network handling time and introduces a flow-control mechanism at the local network level. While the idea of bundling messages to increase CPU efficiency is not new, there are no current methods of bundling within the new High Level Architecture (HLA). This proposed process is a novel approach to introduce flow control, priority message handling and increase address space while utilizing bundled data delivery. For traditional network delivery, typical CPU usage from network data varies as a function of traffic load, ranging from 5% at 500 messages-per-second to over 80% at 4,000 messages-per-second. The new bundling process requires 10% at 500 messages-per-second but only increases to 13% at 4,000 messages-per-second.
DTIC
Protocol (Computers); Internets; Architecture (Computers); Computer Networks

19980038267 California Univ., Dept. of Computer Science, Los Angeles, CA USA
ANDS (Advanced Networking and Distributed Systems) ***Final Report, 1 Jun. 1991 - 31 May 1997***
May 31, 1997; 10p; In English
Contract(s)/Grant(s): MDA972-91-J-1011

Report No.(s): AD-A336954; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Major topics of this report include: (1) High Speed Networking: (a) Fast Packet Switching Using Multistage Interconnection Networks and (b) Analysis of Competing Lightwave Networks; (2) Architecture and Parallel Processing: (a) Performance of Boolean n-Cube Interconnection Networks, (b) Distributed Simulation Task, and (c) A New Model of Load Sharing.

DTIC

Data Processing; Local Area Networks; Parallel Processing (Computers)

19980040932 North Carolina Agricultural and Technical State Univ., School of Engineering, Greensboro, NC USA

Research Instrumentation for DoD Research ***Final Report***

Feb. 18, 1998; 6p; In English

Contract(s)/Grant(s): DAAH04-93-G-0491

Report No.(s): AD-A337668; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Research Instrumentation for DoD Research grant awarded to the Computer Science Department of North Carolina A&T State University has been instrumental in establishing the infrastructure of the department's research capability. Through the funds provided by this grant, the department has been able to: (1) Place a workstation and printer on the desk of every researcher in the department. (2) Create two computer laboratories for use by Computer Science graduate students. (3) Supply workstations for use by graduate researchers. (4) Supply laboratory furniture. (5) Install file and print servers for use by all researchers. (6) Install the necessary software to support a research computing environment.

DTIC

Computer Programs; Workstations

19980040940 Naval Postgraduate School, Monterey, CA USA

Autonomous Agents for Digital Network Maximization

DaBose, Michael W., Naval Postgraduate School, USA; Sep. 1997; 188p; In English

Report No.(s): AD-A337729; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The advent of the computer age has brought about a plenitude of benefits to the human race. Included with these benefits has been the ever increasing demand to transfer exponentially increasing amounts of information, and the associated problems of information sharing. The focus of this thesis, Naval Science Assistance Program (NSAP). and Office of Naval Research (ONR) funded research effort, has been to best utilize available digital communications assets in the radio frequency (RF) spectrum to allow sufficient transfer of information providing DOD assets flexible, rapid, and in-flight reprogramming, re-planning of strike and cruise missile assets, to engage a high value, emergent target, in the shortest possible time. The postulated methods of utilizing autonomous agents to manage information flow across network nodes has applicability to all digital networks. Based upon the pioneering work conducted at Massachusetts Institute of Technology (MET), and previous examination of communications node management, the implementation of independent processes, working on behalf of a host system, to optimize the effective meaningful throughput on a communications channel is not only desirable, but necessary. The evolution of semi intelligent software, whether called Artificial Intelligence, Intelligent Agents, or Autonomous Agents, has reached a level of sophistication allowing the insertion of meaningful articulated processes within existing, and future systems to maximize the network efficiency systematically.

DTIC

Pulse Communication; Cruise Missiles; Frequency Distribution

19980040941 Naval Postgraduate School, Monterey, CA USA

Investigation of Effect of Different Run-Time Distributions on Smartnet Performance

Armstrong, Robert K., Jr., Naval Postgraduate School, USA; Sep. 1997; 207p; In English

Report No.(s): AD-A337730; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This thesis investigates, using in-line simulation, the effect of non-deterministic runtime distributions on the performance of SmartNet's schedule execution using the Opportunistic Load Balancing (OLB) Algorithm, the Limited Best Assignment (LBA) Algorithm, an O(mn squared) Greedy Algorithm, and an O(mn) Greedy Algorithm. SmartNet is a framework for scheduling jobs and machines in a heterogeneous computing environment. Its major strength is its use of both current machine loads and predicted job/machine performance when generating schedules. Schedules are built to meet various Quality of Service requirements using the above algorithms among others. We enhanced SmartNet's simulator so that the runtime distributions could be used for experimentation. The distributions were generated using derivations from our study on NAS Benchmarks. Experiments were run for various categories of job/machine heterogeneity to compare the algorithms which account for both load and expected performance (the Greedy algorithms) against OLB and LBA. For all categories of heterogeneity, the greedy algorithms outperformed the other

two algorithms for both truncated Gaussian and exponential distributions. For these same distributions, the O(mn) Greedy algorithm performed as well as the O(mn2) Greedy algorithm when the heterogeneity of jobs and machines was high.
DTIC
Normal Density Functions; Computer Networks

19980040970 Naval Postgraduate School, Monterey, CA USA
Web-Based Network Management Tools for U.S. Navy Mission-Centric Applications
Andalis, Eric L., Naval Postgraduate School, USA; Sep. 1997; 129p; In English
Report No.(s): AD-A337735; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this thesis is to propose a Web based interface solution to the Navy's mission centric network management needs. A Web based interface provides an easy to manipulate, universal client that can be accessed from any desktop that is connected to the Internet. A Web based interface can be designed to show decision makers and managers the status of network centric information and how it affects the mission of Navy units. This thesis also briefly describes basic network management techniques and the use of the Navy's Automated Digital Networking System (ADNS). As the Navy adopts a network centric approach for every day business, including warfighting, network management becomes extremely critical. Commercial products can't fulfill all Navy specific requirements. The use of the Web is a solution to provide mission centric network management information to the manager and decision maker in an easy to use environment.
DTIC
Navy; Information Management; Military Technology; Military Operations; Pulse Communication

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CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/System Technology and Life Support.

19980037018 Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA USA
Application of Multilayer Feedforward Neural Networks to Precipitation Cell-Top Altitude Estimation
Spina, Michelle S., Massachusetts Inst. of Tech., USA; Schwartz, Michael J., Massachusetts Inst. of Tech., USA; Staelin, David H., Massachusetts Inst. of Tech., USA; Gasiewski, Albin J., Georgia Inst. of Tech., USA; IEEE Transactions on Geoscience and Remote Sensing; Jan. 1998; ISSN 0196-2892; Volume 36, No. 1, pp. 155-162; In English
Contract(s)/Grant(s): NAS5-30791; NAG5-10; NAG5-2545
Report No.(s): NASA/CR-1998-207349; NAS 1.26:207349; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of passive 118-GHz O2 observations of rain cells for precipitation cell-top altitude estimation is demonstrated by using a multilayer feed forward neural network retrieval system. Rain cell observations at 118 GHz were compared with estimates of the cell-top altitude obtained by optical stereoscopy. The observations were made with 2 4 km horizontal spatial resolution by using the Millimeter-wave Temperature Sounder (MTS) scanning spectrometer aboard the NASA ER-2 research aircraft during the Genesis of Atlantic Lows Experiment (GALE) and the COoperative Huntsville Meteorological EXperiment (COHMEX) in 1986. The neural network estimator applied to MTS spectral differences between clouds, and nearby clear air yielded an rms discrepancy of 1.76 km for a combined cumulus, mature, and dissipating cell set and 1.44 km for the cumulus-only set. An improvement in rms discrepancy to 1.36 km was achieved by including additional MTS information on the absolute atmospheric temperature profile. An incremental method for training neural networks was developed that yielded robust results, despite the use of as few as 56 training spectra. Comparison of these results with a nonlinear statistical estimator shows that superior results can be obtained with a neural network retrieval system. Imagery of estimated cell-top altitudes was created from 118-GHz spectral imagery gathered from CAMEX, September through October 1993, and from cyclone Oliver, February 7, 1993.
Author
Neural Nets; Precipitation (Meteorology); Oxygen Analyzers; Atmospheric Temperature; Rain; Spatial Resolution

19980037020 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
A Dispersive Scattering Center, Parametric Model for 1-D ATR
Fuller, Dane F., Air Force Inst. of Tech., USA; Dec. 1997; 66p; In English
Report No.(s): AD-A335655; AFIT/GE/ENG/97D-05; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The dispersive scattering center (DSC) model characterizes high-frequency backscatter from radar targets as a finite sum of localized scattering geometries distributed in range, these geometries, along with their relative locations, can be conveniently used as features in a one-dimensional automatic target recognition (ATR) algorithm. The DSC model's type and range parameters correspond to geometry and distance features according to the geometric theory of diffraction (GTD). Since these parameters are estimated in the phase history domain of the radar signal, the range parameter does provide superresolution in the time domain. to demonstrate the vi ability of feature extraction based on the DSC model's range and type parameters, a four class ATR experiment was performed. The experimental data contains 301 direct range measurements each for four model aircraft of similar size and shape at 0 degrees elevation and from 0 to 30 degrees azimuth. After implementing DSC model feature extraction on this data, a fully-connected, two-layer neural net obtained over 98% classification accuracy. In addition, DSC model feature extraction offers an approximate 85% reduction in the number of features compared to the numerous Fourier bin magnitudes in template matching approaches to ATR.
DTIC
Neural Nets; Target Recognition; Radar Imagery; Pattern Recognition; Radar Range

19980037239 Massachusetts Inst. of Tech., Cambridge, MA USA
Learning Maneuvers Using Neural Network Models ***Final Report, 1 Sep. 1993 - 30 Jun. 1997***
Lozano-Perez, Tomas, Massachusetts Inst. of Tech., USA; Nov. 03, 1997; 22p; In English
Contract(s)/Grant(s): F49620-93-I-0379
Report No.(s): AD-A335691; AFRL-SR-BL-TR-98-0107; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This grant covered the completion of the PhD thesis of Paul Viola and the initiation of the PhD work of Oded Maron. Viola's work was on alignment of 2 and 3 dimensional objects based on maximization of mutual information. The technique depends only on object shape and is robust to variations of illumination. The algorithms are quite general and can foreseeably be used in a wide variety of imaging situations. Maron's work has focused on a variation on supervised learning called multiple-instance learning, where the task is to learn a concept given positive and negative bags of instances. Each bag may contain many instances but a bag is labeled positive even if only one of the instances in it falls within the concept. A bag is labeled negative only if all the instances in it are negative. This framework has been applied to a variety of problem domains.
DTIC
Algorithms; Domains; Imaging Techniques; Neural Nets; Images

19980037648 California Inst. of Tech., Pasadena, CA USA
Robust Control Theory and Applications ***Final Report, 1 Sep. 1994 - 31 Aug. 1997***
Doyle, John C., California Inst. of Tech., USA; Feb. 06, 1998; 46p; In English
Contract(s)/Grant(s): F49620-94-I-0420
Report No.(s): AD-A337888; AFRL-SR-BL-TR-98-0196; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This AASERT program supported research in robust simulation, hierarchical uncertainty representation, and novel methods for robustness analysis of uncertain systems. In the context of this program, robust simulation means simulating simultaneously sets of initial conditions and disturbance or noise signals. Thus sets of state space must be propagated by the dynamics of the model. Initial investigations have focused on piecewise linear discrete time systems, which map polyhedra to polyhedra at each time step. Linear programming can be used to refine the resulting bounds. This is important if the potentially exponential growth in set descriptions is to be overcome. Hierarchical uncertainty modeling is a new framework to include explicit representation of uncertainty in component modeling. The focus has been on LFTs and implicit (DAE) representations. A variety of examples including parasitics and non linearities illustrate the key ideas. Finally, this report describes new bounds on a spherical mu problem that allows for correlations between uncertainties in an LFT framework. Interestingly, this setting provides quite elegant bounds and simplified computation.
DTIC
Robustness (Mathematics); Control Theory; Computerized Simulation; Systems Analysis; Matrices (Mathematics)

19980037726 Naval Postgraduate School, Dept. of Mathematics, Monterey, CA USA
A Combat Simulation Analysis of Autonomous Legged Underwater Vehicles, ***Oct. 1996 - Sep. 1997***
Middlebrook, Edwin E., Marine Corps, USA; Mansager, Bard K., Naval Postgraduate School, USA; Borges, Carlos F., Naval Postgraduate School, USA; Sep. 1997; 15p; In English
Report No.(s): AD-A335557; NPS-MA-97-006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Autonomous Legged Underwater Vehicles (ALUVs) are inexpensive crab-like robotic prototypes which will systematically hunt and neutralize mines en masse in the Very Shallow Water and the Surf Zone (VSW/SZ). With the advent of mine proliferation

and the focal shift of military power to the littorals of the world, ALUVs have the potential to fill a critical need of the USA Navy and Marine Corps Mine CounterMeasure (MCM) forces. Duplicating the MCM portion of the Kernel Blitz 95 exercise whenever feasible, this thesis uses the Janus interactive combat wargaming simulation to model and evaluate the effectiveness of the ALUV as a MCM. Three scenarios were developed: an amphibious landing through a minefield using no clearing/breaching; an amphibious landing through a minefield using current clearing/breaching techniques; and an amphibious landing through a minefield using ALUVs as the clearing/breaching method. This thesis compares the three scenarios using landing force kills, cost analysis and combat power ashore as measures of effectiveness.
DTIC
Combat; Computerized Simulation; Underwater Vehicles; Navy; Amphibious Vehicles

19980038149 Army Research Lab., Adelphi, MD USA
Basin Sculpting a Hybrid Recurrent Feedforward Neural Network ***Final Report, Oct. 1996 - Jun. 1997***
Brabel, Michael J., Army Research Lab., USA; Jan. 1998; 20p; In English
Report No.(s): AD-A336386; ARL-TR-1522; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The architecture of a recurrent neural-network-based content-addressable memory is detailed along with companion training algorithm. The memory is designed to store vectors composed of strings of the integers 1 through 9. The performance characteristics of the model-memory capacity and basin size-are presented.
DTIC
Neural Nets; Memory (Computers); Feedforward Control; Architecture (Computers)

19980038251 California Inst. of Tech., Pasadena, CA USA
Nonlinear Robust Control Theory and Applications ***Final Report, 1 Sep. 1993 - 31 Aug. 1996***
Doyle, John C., California Inst. of Tech., USA; Jan. 18, 1997; 11p; In English
Contract(s)/Grant(s): F49620-93-I-0545
Report No.(s): AD-A336238; AFRL-SR-BL-TR-98-0106; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Model based control methods are commonly used in the design of large, complex systems. Specifically, a mathematical model of the system is constructed, utilizing, for example, first principles analysis and experimental data, which is then used for subsequent control system design and analysis. For the purposes of feedback control highly accurate models are desired. However, such accuracy often requires that complicated high order models be used, which in turn lead to more difficult control design problems from both an engineering and a computational perspective. The emphasis of this research is on the development of methods for reducing the size and complexity of the model while retaining the essential features of the system description. The main goal of these methods is to find a simplified system model which describes the physical system accurately enough so that controllers designed based on this simplified model perform well when implemented on the real system. Directly related to the topic of model reduction are the realization theory concepts of minimality and its converse reducibility, which are also addressed in detail in this thesis.
DTIC
Control Systems Design; Control Theory; Mathematical Models; Nonlinearity; Systems Analysis

19980040077 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
FPGA Processor Implementation for the Forward Kinematics of the UMDH
Parmley, Steven M., Air Force Inst. of Tech., USA; Dec. 1997; 180p; In English
Report No.(s): AD-A336773; AFIT/GE/ENG/97D-21; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The focus of this research was on the implementation of a forward kinematic algorithm for the Utah MIT Dexterous Hand (UMDH). Specifically, the algorithm was synthesized from mathematical models onto a Field Programmable Gate Array (FPGA) processor. This approach is different from the classical, general purpose microprocessor design where all robotic controller functions including forward kinematics are executed serially from a compiled programming language such as C. The compiled code and subsequent real time operating system must be stored on some form of nonvolatile memory, typically magnetic media such as a fixed or hard disk drive, along with other computer hardware components to allow the user to load and execute the software. With a future goal of moving the controllers to a portable platform like a dexterous prosthetic hand for amputee patients, the application of such a hardware implementation is impossible. Instead, this research explores a different implementation based on a modular approach of dedicated hardware controllers. The controller for the forward kinematics of the UMDH is used as a test case. The resulting FPGA processor replaces a robotic system's burden of repetitive and discrete software system calls with a stand

alone hardware interface that appears more like a single hardware function call. The robotic system is free to tackle other tasks while the FPGA processor is busy computing the results of the algorithm.
DTIC
Real Time Operation; Robotics; Kinematics

19980040093 Alabama Univ., Huntsville, AL USA
Development and Integration of Control System Models ***Final Report, 1 Apr. 1997 - 31 Mar. 1998***
Kim, Young K., Alabama Univ., USA; Mar. 31, 1998; 77p; In English
Contract(s)/Grant(s): NAS8-97095; NASA Order H-28168-D
Report No.(s): NASA/CR-1998-207756; NAS 1.26:207756; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The computer simulation tool, TREETOPS, has been upgraded and used at NASA/MSFC to model various complicated mechanical systems and to perform their dynamics and control analysis with pointing control systems. A TREETOPS model of Advanced X-ray Astrophysics Facility - Imaging (AXAF-1) dynamics and control system was developed to evaluate the AXAF-I pointing performance for Normal Pointing Mode. An optical model of Shooting Star Experiment (SSE) was also developed and its optical performance analysis was done using the MACOS software.
Author
Computerized Simulation; Dynamic Control; X Ray Astrophysics Facility; Pointing Control Systems; Performance Tests; Stellar Models; Systems Analysis; Control Simulation; X Ray Imagery; Applications Programs (Computers)

19980040931 Arizona State Univ., Tempe, AZ USA
Real Time Control and Experimental Verification of Semiconductor Processing ***Final Report***
Tsakallis, Kostas, Arizona State Univ., USA; Kozicki, Michael, Arizona State Univ., USA; Jan. 1997; 27p; In English
Contract(s)/Grant(s): F49620-93-I-0524
Report No.(s): AD-A337647; AFRL-SR-BL-TR-98-0185; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For a typical production sequence consisting of numerous steps, the resulting silicon wafers contain a large number of devices. Regardless of the nature of the device, certain parameters will vary from one device to another across the wafer surface. These variations are largely due to imperfections in the nature of the fabrication process. For example, oxide growth may not be exactly uniform from one device to another due to uneven heating of the wafer surface during processing. Doping may vary as a function of position due to the nature of the ion implantation process. Variation in a process parameter is undesirable since it results in a deviation from a resulting device parameter goal, and too much deviation can cause a device to function improperly or fail.
DTIC
Semiconductors (Materials); Real Time Operation; Wafers

19980040951 Michigan Univ., Ann Arbor, MI USA
Robust, Nonlinear Feedback Control ***Final Report, 1 Oct. 1994 - 30 Sep. 1997***
Bernstein, Dennis S., Michigan Univ., USA; Nov. 21, 1997; 19p; In English
Contract(s)/Grant(s): F49620-95-I-0019
Report No.(s): AD-A337881; AFRL-SR-BL-TR-98-0188; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project has encompassed research in four areas of control theory, namely robust, fixed structure control, identification, adaptive cancellation, and nonlinear control. The robust, fixed structure control techniques have been implemented in a mat lab tool box for control design. The identification techniques include recursive methods with guaranteed convergence for high order linear systems. The adaptive cancellation methods provide disturbance rejection for systems with uncertain or time varying disturbance spectra with minimal system modeling. Nonlinear techniques for stabilizing unbalanced rotors and for finite time stabilization have been developed. Experimental implementation and validation of the control methods developed under this project was performed on several laboratory scale testbeds, including an acoustic noise experiment and an unbalanced rotating shaft experiment.
DTIC
Feedback Control; Adaptive Control; Control Theory; Control Systems Design

19980041204 Yale Univ., Dept. of Computer Science, New Haven, CT USA
Mathematical Methods for the Implementation of Neural Networks ***Final Report, 15 Aug. 1992 - 30 Jun. 1996***
Mjolsness, Eric, Yale Univ., USA; Dec. 18, 1996; 8p; In English
Contract(s)/Grant(s): F49620-92-J-0465
Report No.(s): AD-A336777; AFRL-SR-BL-TR-98-0138; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We present a novel optimizing network architecture with applications in vision, learning, pattern recognition and combinatorial optimization. This architecture is constructed by combining the following techniques: (1) deterministic annealing, (2) self-amplification, (3) algebraic transformations, (4) clocked objectives, and (5) soft assign. Deterministic annealing in conjunction with self-amplification avoids poor local minima and ensures that a vertex of the hypercube is reached. Algebraic transformations and clocked objectives help partition the relaxation into distinct phases. The problems considered have doubly stochastic matrix constraints or minor variations thereof. We introduce a new technique, soft assign, which is used to satisfy this constraint. Experimental results on different problems are presented and discussed.
DTIC
Neural Nets; Optimization; Applications of Mathematics

19980041214 NERAC, Inc., Tolland, CT USA
Computer Algebra. (Latest citations from the INSPEC Database)
Jan. 1998; In English
Report No.(s): PB98-851991; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning computer algebra (CA), computer-based symbolic manipulation, CA algorithms, software packages, and systems used in mathematics, engineering, physics, biology, aerospace, and military computing are reviewed. References also discuss CA educational systems, CA in control systems, symbolic capabilities, symbolic programming languages, computer logic systems, and computer-generated graphical representations. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Computer Techniques

64
NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

19980037227 Maryland Univ., Dept. of Computer Science, College Park, MD USA
Logic-based Real Time Problem Solving Systems ***Final Report, 1 Dec. 1992 - 31 Aug. 1996***
Subrahmanian, V. S., Maryland Univ., USA; Hendler, James, Maryland Univ., USA; Jan. 31, 1997; 11p; In English
Contract(s)/Grant(s): F49620-93-I-0065
Report No.(s): AD-A335713; AFRL-SR-BL-TR-98-0110; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The problem of guaranteeing safety in a class of robot motion problems has been studied. Necessary and sufficient conditions for ensuring safety have been determined. Functional relationships between the number, size, and speed of obstacles and the robot's maximum speed to ensure safety have been developed.
DTIC
Real Time Operation; Robot Dynamics; Robots

19980037594 Defence Research Establishment Atlantic, Dartmouth, Nova Scotia Canada
Nonlinear Finite Element Analyses of Damaged Stiffened Panels
Hu, Thomas S., Defence Research Establishment Atlantic, Canada; Nov. 1997; 39p; In English
Report No.(s): AD-A335546; DREA-TM-97/254; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ship hulls suffer various types of damage during operation. This damage can be corrosion caused by the marine environment or dents resulting from external forces. In order to make efficient repair decisions, residual strength of the damaged component needs to be assessed. The assessment can be carried out with numerical models such as nonlinear finite element methods or simplified approaches, but this requires experimental verification. DREA conducted a joint stiffened panel strength testing project with the U. S. Interagency Ship Structural Committee (SSC). Five stiffened panels in this project, having dimensions approximately equal to a typical stiffened panel at the upper deck of the Canadian Patrol Frigate (CPF), had deliberately created damage. Three of the panels had part of the web or flange of the stiffener removed while the other two had permanent deflection caused by large lateral forces. A series of finite element analyses were conducted to predict the collapse load as well as to simulate the buckling

behaviour. This memorandum summarizes the finite element results and their relation with the test observations. Some discussion and suggestions are also provided.
DTIC
Ship Hulls; Finite Element Method; Residual Strength; Buckling

19980037649 Princeton Univ., Program in Applied and Computational Mathematics, NJ USA
Tools for Time-Frequency Analysis ***Final Report, 1 Apr. 1995 - 30 Sep. 1997***
Daubechies, Ingrid, Princeton Univ., USA; Dec. 1997; 5p; In English
Contract(s)/Grant(s): F49620-95-I-0290
Report No.(s): AD-A337887; AFRL-SR-BL-TR-98-0186; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Together with students and postdocs, the PI has worked on the mathematical aspects and applications of various tools in time frequency or time scale analysis. they have brought a deeper understanding to the geometry of redundant representations (frames), and shown the usefulness of frames for multiple description transmission, designed to withstand partial loss of information if some of the channels fail. They have also worked on subdivision schemes for non-uniform data, which can be used to provide efficient data compression for irregularly spaced data which are a superposition of fairly smooth signals with transients. Finally, they have obtained results on several reallocation schemes, aimed at extracting different components from complex signals, without too much pollution from the analyzing tool.
DTIC
Data Compression; Failure; Fourier Transformation; Wavelet Analysis

19980038381 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Department of Mathematics, ***1 Jan. - 31 Dec. 1996***
Woods, W. Max, Naval Postgraduate School, USA; Nov. 1997; 40p; In English
Report No.(s): AD-A337493; NPS-09-97-006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report contains summaries of research projects in the Department of Mathematics. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts.
DTIC
Mathematical Models; Research Projects

19980038406 Department of the Navy, Washington, DC USA
System and Method for Incorporating Segmentation Boundaries into the Calculation of Fractal Dimension Features for Texture Discrimination
Rogers, George W., Inventor, Department of the Navy, USA; Priebe, Carey E., Inventor, Department of the Navy, USA; Solka, Jeffrey L., Inventor, Department of the Navy, USA; Lorey, Richard A., Inventor, Department of the Navy, USA; Julin, Erik G., Inventor, Department of the Navy, USA; Sep. 23, 1997; 18p; In English; Supersedes US-Patent-Appl-SN-308112, AD-D017254.
Patent Info.: Filed 15 Sep. 1994; US-Patent-Appl-SN-308112; US-Patent-5,671,294
Report No.(s): AD-D018737; No Copyright; Avail: US Patent and Trademark Office, Microfiche
Image analysis is performed by defining segmentation boundaries within an image by using wavelet theory or some other suitable method. Such boundaries can be incomplete, irregular, and/or multi-valued. The segmentation boundaries are then incorporated into feature calculations related to fractal dimensions for each pixel using a diffusion related method or a Dijkstra potential related method. These features are then used in statistical techniques to distinguish among textures or classes of interest. The system performing the image analysis is trained (or supervised) on data from different classes within an image or images. This enables the system to then later identify these classes in different images. The system can be used for Computer Aided Diagnosis (CAD) of mammograms or other medical imagery.
DTIC
Image Analysis; Boundaries; Segments; Regression Analysis; Wavelet Analysis; Statistical Analysis; Image Processing; Pattern Recognition

19980040080 Minnesota Univ., School of Mathematics, Minneapolis, MN USA
Sensor Management Research ***Final Report, 1 Sep. 1996 - 15 Oct. 1997***
Friedman, Avner, Minnesota Univ., USA; Kastella, Keith, Lockheed Martin Tactical Defense Systems, USA; Dec. 31, 1997; 7p; In English
Contract(s)/Grant(s): F49620-96-I-0382

Report No.(s): AD-A336869; AFRL-SR-BL-TR-98-0131; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This grant is supporting development of mathematical foundations for sensor management systems. This year's accomplishments are in three areas: Extension of a Kalman-filter based discrimination metric to interacting multiple model filters; extension of sensor management based on Joint Multitarget Probabilities to incorporate multiple sensor modes and target classification; and development of fast methods to solve the Fokker-Planck equation for real-time non-linear filtering applications. to support sensor management representations of multitarget probability densities must be developed that model the uncertainty between quantities such as the number of targets, their locations and their class. to solve this problem and study it in a simple setting, the notion of Joint Multitarget Probabilities for detection, tracking, and target classification was developed and tested. In certain cases the time-evolution of these probabilities is characterized by a partial differential equation called the Fokker-Planck equation leading to a nonlinear filter. Several prototype nonlinear filters using the Alternating Direction Implicit scheme to solve the Fokker-Planck equation in real-time were formulated. In these applications it seems to offer significant improvement in estimation performance at a supportable cost in computational load.

DTIC

Kalman Filters; Multisensor Fusion; Nonlinear Filters; Real Time Operation; Alternating Direction Implicit Methods; Fokker-Planck Equation

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing: Monte Carlo method; and stochastic processes.

19980038201 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

Visualization and Animation of a Missile/Target Encounter

Bush, Jeffrey T., Air Force Inst. of Tech., USA; Dec. 1997; 115p; In English

Report No.(s): AD-A336994; AFIT-GCS-ENG-97D-05; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Existing missile/target encounter modeling and simulation systems focus on improving probability of kill models. Little research has been done to visualize these encounters. These systems can be made more useful to the engineers by incorporating current computer graphics technology for visualizing and animating the encounter. Our research has been to develop a graphical simulation package for visualizing both endgame and full fly-out encounters. Endgame visualization includes showing the interaction of a missile, its fuze cone proximity sensors, and its target during the final fraction of a second of the missile/target encounter. Additionally, this system displays dynamic effects such as the warhead fragmentation pattern an d the specific skewing of the fragment scattering due to missile yaw at the point of detonation. Fly-out visualization, on the other hand, involves full animation of a missile from launch to target. Animating the results of VisSim fly-out simulations provides the engineer a more efficient means of analyzing his data. This research also involves investigating fly-out animation via the World Wide Web.

DTIC

Missiles; Computer Animation; Scientific Visualization; Targets

66
SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

19980037587 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

Air Force Aircraft: Reorganizing Mobility Aircraft Units Could Reduce Costs

Jan. 1998; 37p; In English

Report No.(s): AD-A334930; GAO/NSIAD-98-55; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over the past few years, the Department of Defense (DOD) has been interested in modernizing its forces with new weapons and equipment. For a variety of reasons, these efforts have been stymied, and funds that DOD expected to have available to modernize the force have been needed instead for current operational activities. Therefore, you have expressed an interest in reducing operating costs. We have been assessing various Air Force activities to determine the feasibility of reducing operating costs. A few years ago, we evaluated whether the Air Force could operate its fighter forces more cost-effectively. In May 1996, we reported that the Air Force's fighter force was not organized economically and recommended that the Air Force develop an implementation plan for operating its fighter force in larger, more cost-effective squadrons. DOD concurred with that recommendation. For this follow-on effort, we assessed the cost-effectiveness of organizing the Air Force's airlift and refueling force into fewer, larger-sized

squadrons and wings. In making this assessment, we (1) evaluated the effect that reorganization may have on mission accomplishment, (2) determined whether costs could be reduced through redistributing aircraft among fewer wings, and (3) developed five possible options for redistributing C-130 and KC-135 aircraft among fewer wings at lower operating costs. This report focuses on the reserve component combat C-130 and KC-135 aircraft.
DTIC
Cost Effectiveness; Operating Costs; Cost Reduction; Air Transportation; Defense Program; Mobility

19980038230 Wright Lab., Wright-Patterson AFB, OH USA
FY98 Human Systems Technology Area Plan
Jan. 1998; 34p; In English
Report No.(s): AD-A338012; No Copyright; Avail: Issuing Activity (Wright Lab., Wright-Patterson AFB, OH), Hardcopy, Microfiche

The Armstrong Laboratory is the Air Force laboratory uniquely positioned to engage a diverse and multi-disciplined technological arsenal to address the warfighter's human systems deficiencies. The capability of bringing to hear the full weight of physical, biological, biomedical, and behavioral sciences along with human factors engineering is now needed more than ever in the post Cold War era. Today, instead of facing a single massive threat, we are challenged with the potential for simultaneous multiple low intensity conflicts. Instead of a robust DoD budget, we are now faced with conducting both operations and acquisition in a fiscal climate that is highly resource constrained.
DTIC
Human Factors Engineering; Human Behavior

19980038331 Wright Lab., Wright-Patterson AFB, OH USA
FY98 Research Technology Area Plan
Jan. 1998; 36p; In English
Report No.(s): AD-A338016; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mission of the Air Force Office of Scientific Research (AFOSR) is to sponsor and sustain Air Force relevant basic research to rapidly transfer and transition research results to current and future systems that support the Air Force global engagement strategy. This vigorous, focused, and diversified basic research program provides our nation with the required depth and scope of options for new and advanced technologies to meet the air and space superiority goals of the Air Force. The rapid pace of change in the post-Cold War era necessitates a shifting emphasis in military technology investments, as the Scientific Advisory Board suggests in their New World Vistas (NWV) study. AFOSR has incorporated their recommendations as a guide in selecting new research initiatives. Furthermore, the relative decrease in planned acquisition of new weapon systems makes it even more important to build a closer partnership with the U.S. industrial base, logistics support and the operational Air Force.
DTIC
Technology Transfer; Research and Development; Military Operations

19980038382 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Department of Operations Research, *1 Jan. - 31 Dec. 1996*
Petho, Frank C., Naval Postgraduate School, USA; Brown, Gerald, Naval Postgraduate School, USA; Nov. 1997; 55p; In English
Report No.(s): AD-A337511; NPS-09-97-011; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report contains summaries of research projects in the Department of Operations Research. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts.
DTIC
Operations Research; Research Projects

19980038385 Wright Lab., Wright-Patterson AFB, OH USA
FY98 Space and Missiles Technology Area Plan
Jan. 1998; 40p; In English
Report No.(s): AD-A338015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Rapid and cost effective research, development and transition of advanced space technologies enables affordable and decisive military capabilities for US forces. The Space and Missiles Technology Area Plan is developing technologies that provide options for the warfighter that take maximum advantage of space as an operating environment. In the face of declining budgets and manning levels, constraints are placed on the S&T programs. We constantly strive to make technology investments in the high payoff

areas. Our investment strategy emphasizes improved productivity at reduced cost. The need for affordability is a pervasive requirement that is emphasized throughout all aspects of the Space and Missiles Technology Area Plan. The breadth of technologies pursued in the Space and Missile Technology Area Plan is driven by specific military operational needs described in the Future Joint Warfighting Capabilities. These are: (1) to maintain near perfect knowledge of the enemy and communicate that to all forces in near-real time; (2) to engage regional forces promptly in decisive combat, on a global basis; (3 to employ a range of capabilities which allow achievement of military objectives with minimum casualties and collateral damage; (4) to control the use of space; and (5) to counter the threat to the CONUS and deployed forces of future ballistic cruise missiles and other weapons of mass destruction.
DTIC
Ballistic Missiles; Research and Development; Guidance (Motion); Space Commercialization

19980040083 Naval Postgraduate School, Monterey, CA USA
Modeling the Combat Power Potential of Marine Corps Close Air Support
Gillespie, Thomas C., Naval Postgraduate School, USA; Sep. 1997; 124p; In English
Report No.(s): AD-A336885; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis proposes a numerical measure of the combat power potential of U.S. Marine Corps close air support (CAS) aircraft. The combat power potential of a weapon system is defined as the rate at which the system could deliver lethal fire to any point on the battlefield, accounting for particular and relevant battlefield and enemy characteristics. This measure is expressed in units of 'kills per minute,' where each point is hypothesized to have an infinite supply of instantaneously replaced targets. The collection of these values (i.e., kills per minute for each battlefield point) is suitable for display as a 'combat potential surface,' overlaid on a battlefield map. In this thesis, points of higher potential are keyed to brighter colors (e.g., red, yellow, orange). The end result is a battlefield visualization tool to assist commanders and staffs in CAS planning.
DTIC
Weapon Systems; System Effectiveness

71
ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19980037232 Florida State Univ., Tallahassee, FL USA
Advances in Numerical Boundary Conditions for Computational Aeroacoustics
Tam, Christopher K. W., Florida State Univ., USA; 1997; 16p; In English
Contract(s)/Grant(s): NAG1-1776
Report No.(s): NASA/CR-97-207481; NAS 1.26:207481; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Advances in Computational Aeroacoustics (CAA) depend critically on the availability of accurate, nondispersive, least dissipative computation algorithm as well as high quality numerical boundary treatments. This paper focuses on the recent developments of numerical boundary conditions. In a typical CAA problem, one often encounters two types of boundaries. Because a finite computation domain is used, there are external boundaries. On the external boundaries, boundary conditions simulating the solution outside the computation domain are to be imposed. Inside the computation domain, there may be internal boundaries. On these internal boundaries, boundary conditions simulating the presence of an object or surface with specific acoustic characteristics are to be applied. Numerical boundary conditions, both external or internal, developed for simple model problems are reviewed and examined. Numerical boundary conditions for real aeroacoustic problems are also discussed through specific examples. The paper concludes with a description of some much needed research in numerical boundary conditions for CAA.
Author
Boundary Conditions; Aeroacoustics; Computation

19980037423 NASA Kennedy Space Center, Cocoa Beach, FL USA
Ultrasonic Leak Detection System
Youngquist, Robert C., Inventor, NASA Kennedy Space Center, USA; Moerk, J. Steven, Inventor, NASA Kennedy Space Center, USA; Jan. 20, 1998; 16p; In English
Patent Info.: Filed 17 Oct. 1995; NASA-Case-KSC-11751; US-Patent-5,710,377; US-Patent-Appl-SN-540616; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A system for detecting ultrasonic vibrations. such as those generated by a small leak in a pressurized container. vessel. pipe. or the like. comprises an ultrasonic transducer assembly and a processing circuit for converting transducer signals into an audio frequency range signal. The audio frequency range signal can be used to drive a pair of headphones worn by an operator. A diode rectifier based mixing circuit provides a simple, inexpensive way to mix the transducer signal with a square wave signal generated by an oscillator, and thereby generate the audio frequency signal. The sensitivity of the system is greatly increased through proper selection and matching of the system components. and the use of noise rejection filters and elements. In addition, a parabolic collecting horn is preferably employed which is mounted on the transducer assembly housing. The collecting horn increases sensitivity of the system by amplifying the received signals. and provides directionality which facilitates easier location of an ultrasonic vibration source.

Official Gazette of the U.S. Patent and Trademark Office

Detection; Ultrasonic Densimeters; Vibration; Leakage

19980037597 NASA Lewis Research Center, Cleveland, OH USA

Precision Thickness Variation Mapping via One-Transducer Ultrasonic High Resolution Profilometry for Sample with Irregular or Rough Surface

Roth, Don J., Inventor, NASA Lewis Research Center, USA; Dec. 23, 1997; 14p; In English

Patent Info.: Filed 22 Apr. 1996; NASA-Case-LEW-16228-1; US-Patent-5,700,955; US-Patent-Appl-SN-641132; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

An apparatus and method for determination of sample thickness and surface depression utilizing ultrasonic pulses. The sample is held in a predetermined position by a support member having a reference surface. Ultrasonic pulses travel through a medium of known velocity propagation and reflect off the reference surface and a sample surface. Time of flight data of surface echoes are converted to distances between sample surfaces to obtain computer-generated thickness profiles and surface mappings.

Official Gazette of the U.S. Patent and Trademark Office

Ultrasonic Tests; Surface Roughness; Transducers

19980037707 Department of the Navy, Washington, DC USA

Acoustic Window and Method for Making the Same

Roush, Robert A., Inventor, Department of the Navy, USA; DeAngelis, Robert J., Inventor, Department of the Navy, USA; Sep. 23, 1997; 10p; In English; Supersedes US-Patent-Appl-SN-496490.

Patent Info.: Filed 29 Jun. 1995; US-Patent-Appl-SN-496490; US-Patent-5,670,233

Report No.(s): AD-D018735; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method for making polyurethane acoustic windows. A molding material is applied to a reservoir connected to the bottom of the mold to fill the mold under the influence of a vacuum applied at the top of the mold. After initialling filling the mold, a second reservoir connects to the vacuum port and additional material is added to the first reservoir to partially fill the second reservoir. Thereafter the mold with the reservoirs attached is located in a pressure oven for curing. After curing the mold an acoustic window is removed from the mold for post molding operations.

DTIC

Acoustic Emission; Windows (Intervals); Technologies

19980037721 Defence Science and Technology Organisation, Canberra, Australia

Underwater Acoustic Imaging: A Computing Hardware Approach to Rapid Processing

Blair, David G., Defence Science and Technology Organisation, Australia; Sep. 1997; 42p; In English

Report No.(s): AD-A335304; DSTO-TN-0099; DODA-AR-010-281; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High-resolution underwater acoustic imaging using multi-element arrays implies a large computational load. For a three-dimensional viewing volume resolved into 3 x 10(exp 9) voxels (volume pixels), with 4000 elements, the computations needed are around 9 x (1.2 x 10(exp 13)) floating-point operations. This report develops one of the more promising options for computing the full image. First, parallel computation is used to deal with the different sensor elements simultaneously, when calculating the address of the appropriate instantaneous voltage at the sensor element-or, equivalently, the calculation of the round-trip distance traveled by the acoustic pulse. This calculation requires, in a typical near-field situation, the computation either of a square root or of a fifth degree polynomial. This polynomial allows increased parallelism. Second, the summation in the beamforming is like-

wise done with a high degree of parallelism. A machine with the above design, with 10(exp 9) clock cycles per second, would compute the entire image in roughly 6 seconds. Cost and availability are not investigated.
DTIC
Underwater Acoustics; Image Analysis; Computation; Signal Processing; Arrays; Sonar

19980037722 Department of the Navy, Washington, DC USA
Fuzzy Controller for Acoustic Vehicle Target Intercept Guidance
Bessaini, Anthony F., Inventor, Department of the Navy, USA; Pinkos, Robert F., Inventor, Department of the Navy, USA; Sep. 23, 1997; 26p; In English; Supersedes US-Patent-Appl-SN-498810, AD-D017680.
Patent Info.: Filed 6 Jul. 1995; US-Patent-Appl-SN-498810; US-Patent-4,671,138
Report No.(s): AD-D018743; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A target intercept guidance system for directing a steerable object, such as a torpedo with an acoustic homing device. The guidance system senses the bearing and range between a first site and a second site and determines the position of a guidance point for the steerable object as it moves toward the second site. Two error functions are produced. The first error function represents the angle between the bearing from the guidance point of the steerable object to the second site and me course of the steerable object. The second error signal represents an estimate of the rate of change of that angle. These error signals are classified into first and second sensed linguistic variables based upon membership functions from the first and second sensed variable membership function sets to become fuzzy inputs that produce fuzzy outputs comprised of control output linguistic variables and corresponding control output membership functions from a control output membership function set based upon logical manipulation of the fuzzy inputs. These fuzzy control output membership functions are converted into an output having an appropriate form for control after being conditioned in response to other information including the relative positions of the guidance point of the steerable object and the second site.
DTIC
Controllers; Acoustics; Submarines; Launching

19980037924 Naval Facilities Engineering Service Center, Port Hueneme, CA USA
TCNOISE: A Computer Program to Calculate Noise Levels and Directivity from a Jet Engine Test Cell
Kodres, C. A., Naval Facilities Engineering Service Center, USA; Lancey, T. W., Naval Facilities Engineering Service Center, USA; Oct. 1997; 36p; In English
Report No.(s): AD-A336321; NFESC-TR-2085-ENV; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the FORTRAN program Test Cell NOISE (TCNOISE). The program predicts noise emitted by jet engine test cells. It is to be used in conjunction with the Naval Facilities Engineering Service Center's jet engine test cell aerothermal performance computer model, reading output files from this code to acquire the flow properties necessary for the calculation of jet noise and surface noise. The theoretical basis of TCNOISE, instructions for running the program, example runs, and comparisons of program predictions with measured noise emissions are included in the report.
DTIC
Computerized Simulation; Computer Programs; Applications Programs (Computers); Noise (Sound); Acoustic Measurement; Noise Measurement; Jet Aircraft Noise

19980038206 Washington Univ., Applied Physics Lab., Seattle, WA USA
Report of a Survey of US Academic Programs in Ocean and Underwater Acoustics
Lackle, K. W., Washington Univ., USA; Dec. 1997; 53p; In English
Contract(s)/Grant(s): N00014-96-I-0246
Report No.(s): AD-A336734; APL-UW-TR-9704; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Underwater acoustics remains the principal means to detect and locate submarines and other underwater objects. For this reason, the Office of Naval Research has sponsored a vigorous research program in underwater acoustics and related fields at both academic institutions and Navy in house organizations for many years. Unfortunately, no other Federal Government funding agency sponsors research in this area, and as a result the health, strength, and growth of the field in the US depends entirely on the ONR program. Interviews of senior U.S. acoustician and visits to a number of major institutions indicate that recent reductions in Naval research budgets have caused a significant decline in the vitality of the ocean acoustics research community in the U.S., especially in its capability to train graduate students in at sea experimental techniques and maintain its sea going infrastructure. Although a number of initiatives are identified that would improve the situation, only an increase in financial support will completely solve the problem. The current level of Federal funding is inadequate to support long-term Navy requirements for acousti-

cian, though it may be adequate for the current environment of reduced budgets and priorities. The strength of this field, virtually the only one entrusted entirely to ONR's care, is not being sustained.
DTIC
Underwater Acoustics; Antisubmarine Warfare

19980038263 Washington Univ., Applied Physics Lab., Seattle, WA USA
General Report: Sonochemistry and Sonoluminescence Conference ***Final Report***
Crum, Lawrence A., Washington Univ., USA; Feb. 01, 1998; 14p; In English, 18-29 Aug. 1997, Leavenworth, WA, USA; Sponsored by North Atlantic Treaty Organization, Belgium
Contract(s)/Grant(s): N00014-97-I-0149
Report No.(s): AD-A337616; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The presentation of data that demonstrate that a sonoluminescing bubble can produce observable sonochemistry was also an important and interesting aspect of the ASI. Since sonochemistry has been difficult to study in the past because of the many bubbles that are typically formed within a cavitation field, the development of a system for studying SBSC is considered an important contribution to the field. An additional topic of much discussion was the physical mechanism(s) that lead to the light emission from SBSL. A strongly held theory is that imploding shock waves are developed within the gas during the later stages of bubble collapse. A second view is that asymmetrical collapses of the bubble can lead to liquid jets that penetrate the opposite bubble wall and generate light emission by fractoluminescence. These and many other theories were hotly debated and further calls were made to the experimentalists for additional data.
DTIC
Sonoluminescence; Bubbles

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

19980037584 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Analytical Method to Calculate Activity from Measurements Affected by Coincidence Summing
Popovich, Anthony P., Air Force Inst. of Tech., USA; Dec. 1997; 198p; In English
Report No.(s): AD-A335060; AFIT/GAP/ENP/97D-09; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

An analytical method is developed and applied to find the activities of two radioisotopes based on measurements influenced by true coincidence summing. The method incorporates the solid angle subtended by the detector, the macroscopic cross sections of the materials present, the absolute peak and total efficiencies of the detector, and the modes and probabilities of decay of the radioisotope. With this information, the method corrects for both summing-in and summing-out events. Summing events affect peak counts and cause the calculated activity to differ from the true activity. Thin disk sources of Mo-99 and Cs-136 on the face of a closed-end, coaxial high purity germanium detector have been studied. For Mo-99, the analytical method shows there is a 29% reduction in the 740 keV peak counts due to summing events. This factor adjusts the no-coincidence-assumed activity to within 4.0% of the correct value. As for Cs-136, the analytical method shows a 41% reduction in the 1048 keV peak counts. This factor corrects the simplistic activity to within 0.5% of the correct value. Hence, the results indicate that coincidence summing is the primary cause of activity discrepancies for the given configuration.
DTIC
Radioactive Isotopes; Coincidence Circuits

19980037823 Pittsburgh Univ., Dept. of Physics and Astronomy, Pittsburgh, PA USA
Electron-Temperature Dependence of the Recombination of NH4(+)((NH3)(sub n) Ions with Electrons
Skrzypkowski, M. P., Pittsburgh Univ., USA; Johnson, R., Pittsburgh Univ., USA; Chemical Physics Letters; Aug. 15, 1997; ISSN 0009-2614; Volume 274, pp. 473-477; In English
Contract(s)/Grant(s): NAG5-4116; NAGw-1764
Report No.(s): NASA/CR-97-207335; NAS 1.26:207335; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The two-body recombination of NH4(+)(NH3)(sub 2,3) cluster-ions with electrons has been studied in an afterglow experiment in which the electron temperature T, was elevated by radio-frequency heating from 300 K up to 900 K. The recombination coefficients for the n = 2 and n = 3 cluster ions were found to be equal, alpha(sub 2, sup(2)) = alpha(sub 3, sup(2)) = (4.8 +/- 0.5)

x 10(exp - 6)cu cm/s, and to vary with electron temperature as T(sub c, sup -0.65) rather than to be nearly temperature-independent as had been inferred from measurements in microwave-heated plasmas.
Author
Electrons; Temperature Dependence; Recombination Coefficient; Nitrogen Hydrides

19980038259 Armed Forces Radiobiology Research Inst., Bethesda, MD USA
Retrospective Reconstruction of Radiation Doses of Chernobyl Liquidators by Electron Paramagnetic Resonance
Chumak, V. V., Kiev Univ., USSR; Likhtarev, I. A., Kiev Univ., USSR; Sholom, S. S., Kiev Univ., USSR; Pasalskaya, L. F., Kiev Univ., USSR; Pavlenko, Y. V., Kiev Univ., USSR; Dec. 1997; 48p; In English
Contract(s)/Grant(s): DNA001-95-C-0017
Report No.(s): AD-A336258; AFRRI-CR-97-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Accurate, reliable dose reconstruction is a critical component in the epidemiological followup of liquidators. Dosimetry of teeth by electron paramagnetic resonance (EPR) is a state of the art laboratory technique that is key to this effort. The Scientific Center of Radiation Medicine (SCRM) has developed and refined this technique in order to meet the practical demands of large scale epidemiologic followup of the Chernobyl liquidators. Independent analysis using similar technology was performed by investigators at the University of Utah and showed good correlation with the SCRM results. The lower limit of detection for reliable dose reconstruction was 100 mGy. Techniques were applied to samples from approximately 135 liquidators involved in cleanup activities within the first 2 years after the Chernobyl accident in 1986. Mean dose was 287 mGy, geometric mean was 205 mGy, and median dose value was 200 mGy. The reconstructed dose values range from 30 to 2220 mGy. Correlation of results between the two institutions was generally within 17%. This report also addresses some confounding factors (previous medical x- ray exposures, ultraviolet light effects on anterior teeth, nonlinearity of dose response curves below 100 mGy) and how to deal with them.
DTIC
Radiation Damage; Radiation Tolerance; Dosimeters; Dosage

19980038379 Stanford Univ., Stanford, CA USA
Cooling and Trapping of Atoms and Particles ***Final Report, 1 Nov. 1994 - 31 Oct. 1997***
Chu, Steve, Stanford Univ., USA; Oct. 31, 1997; 8p; In English
Contract(s)/Grant(s): F49620-95-I-0023; AF Proj. 2301
Report No.(s): AD-A337451; AFRL-SR-BL-TR-98-0170; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A number of atom interferometry methods have been introduced and the state of the art in precision atom interferometry have been advanced. An interferometer using laser cooled atoms in an atomic fountain and off-resonant optical Raman pulses between ground states of the atom has been applied to the measurement of the ratio of planck's constant to mass, which is a step in the determination of the fine structure constant. The result has surpassed the next best measurement (the Quantum Hall Effect measurement) by a factor of ten in precision. Also, using an atomic interferometer as an accelerometer, the value of g has been measured and compared to that of the previous best absolute gravimeter (based on a falling corner-cube optical interferometer) with comparable results. Using 'optical tweezers' based on laser trapping techniques, experimental verification of the reputation theory of polymer dynamics, developed by de Genes twenty-five years ago, have been achieved. Other techniques and measurements have been unable to provide the needed verification.
DTIC
Interferometry; Laser Cooling; Trapped Particles; Atomic Beams

19980040043 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Collisional Broadening of Spectral Lines in the X yields b System of O2 and the First Vibrational Band of NO by the Noble Gases
Cornicelli, John J., Air Force Inst. of Tech., USA; Dec. 1997; 133p; In English
Report No.(s): AD-A335199; AFIT/ENP/GAP/97D-01; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Collisional broadening of the rotational spectral lines of the X yield b system of O2 and the first vibrational band of NO by the noble gases is examined by Fourier transform spectroscopy. Peaks of the individual rotational lines are modeled with a Voigt function, from which Lorentzian half widths are extracted. Lorentzian widths are plotted vs. pressure of foreign gas, from which the pressure broadening coefficients and pressure broadening cross sections are calculated. The pressure broadening coefficients are compared to theoretical values determined by past research for O2. NO coefficients are compared to similar research using N2 as collision partner. O2 broadening coefficients/cross sections were found to increase with decreasing rotational quantum num-

ber. Also, a linear dependence is found between cross section and both polarizability of the collision partner and reduced mass of the collision pair.
DTIC
Line Spectra; Collisions; Nitrogen Oxides; Oxygen; Rare Gases; Vibrational Spectra; Collision Parameters

19980040949 Adelphi Technology, Inc., Palo Alto, CA USA
Enhanced correlated-Charge Field Emission ***Annual Report, 15 Oct. 1994 - 15 Feb. 1998***
Piestrup, Melvin A., Adelphi Technology, Inc., USA; Puthoff, Harold E., Institute for Advanced Research, USA; Ebert, Paul J., Nolasco Science Consultants, USA; Feb. 15, 1998; 57p; In English
Contract(s)/Grant(s): F49620-95-C-0005
Report No.(s): AD-A337858; AFRL-SR-BL-TR-98-0204; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
We have studied the harmonic content of current generated by a field emitter in order to determine if there is spatial or temporal coherence between the electrons. Harmonic content was observed to be identical and high (2nd harmonic/fundamental less than 0.45) for both high rates (16,000 events/sec) and low rates (15 events/sec). Statistical analysis shows harmonic content cannot be attributed to the counting system response, but must be considered as true events in which multiple electrons arrive at the detector. Using a single emitted, we compared the spatial distribution of the Thermal Emission (TE) with that of the Field Emission (FE). The two profiles were identical; hence, the TE and FE sources were at the same location. Thus multiple electron emission spectra were not a result of parasitic secondary electron emission from intermediate electrodes or other surfaces. We examined the harmonic content by expanding the beam relative to the detector size. The harmonic content was larger than what one would expect if the spatial distribution of the electrons was entirely random, but not big enough to show spatial coherence. We analyzed charge confinement by van der Waals forces which showed that only large numbers of charges can be spatially correlated. Contamination of the FE surface by absorption is suggested as the origin of the multiple-electron emission.
DTIC
Field Emission; Electric Current; Harmonic Motion; Coherent Scattering; Experimentation

19980041217 Institute of Atomic Physics, Bucharest, Romania
Spatial and Energetic Characterization of X-Ray Emission from Inverse Capillary Discharges ***Final Report***
Ganciu-Petcu, Mihai, Institute of Atomic Physics, Romania; Jun. 25, 1997; 6p; In English
Contract(s)/Grant(s): F61708-96-W-0193
Report No.(s): AD-A337641; SPC-96-4040; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This report results from a contract tasking Institute of Atomic Physics as follows: The contractor will investigate several questions associated with pumping without inversion as described in his proposal.
DTIC
X Ray Lasers; X Rays; Atomic Physics

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OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19980037544 National Optical Astronomy Observatories, Tucson, AZ USA
The Electrostatic Application of Black Flocking for Reducing Grazing Incidence Reflections
Vaughnn, David, National Optical Astronomy Observatories, USA; Tome, Jay A., National Optical Astronomy Observatories, USA; Aug. 1996; 14p; In English
Report No.(s): NOAO-Preprint-723; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Grazing incidence reflections as a source of stray light are a problem which continues to beleaguer optical systems and instrumentation. These reflections tend to be specular and are a primary cause of ghosting. Traditional means of blackening (absorption) fail miserably. Techniques of scattering the undesirable/problem light into a larger (and more benign) solid angle, while successful, are often impractical. Furthermore, while these techniques excel at reducing ghosting, they typically redirect significant light into the diffuse background, reducing the SNR. Black flocking combines the advantages of absorption and scattering. Historical disadvantages of flocking are its poor durability and the difficulty of applying flock to irregular surfaces. Presented here, is the technique of electrostatic application, which overcomes these shortfalls. Bi-directional Reflectance Distribution Function (BRDF) measurements of black flocking are presented and comparisons made with other blackening techniques. An example of this technique is

shown where it is used to improve a low-light spectrographic instrument. Finally, proposed specifications for the application of (black) flocking are made for use in optics.
Author
Electrostatics; Grazing Incidence; Distribution Functions; Bidirectional Reflectance

19980038046 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Analytic Transfer Function of the Forward Propagation of Diffuse Photon Density Waves in Turbid Media with an Embedded Spherical Inhomogeneity
Lasocki, Deborah L., Air Force Inst. of Tech., USA; Dec. 1997; 126p; In English
Report No.(s): AD-A336387; AFIT/EN/ENG/97D-01; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Diffusing photons can be used to detect and localize optical inhomogeneities embedded in turbid media such as clouds, fog, paint and human tissue. This thesis shows that a transfer function derived from an analytic solution of the Helmholtz equation can completely characterize in three dimensions the perturbations in the forward propagation phenomena caused by a spherical defect object in a multiple-scattering medium. Two models of the forward propagation behavior of diffuse photon density waves in homogeneous, infinite, turbid media that contains a spherical inhomogeneity are examined. The first model is an exact analytic solution based on a modal expansion in spherical harmonics. The second model uses Fourier optics theory for wave propagation in a plane through homogeneous turbid media containing a spherical lens. The Fourier optics model is found to be a good approximation to the exact analytic solution when the optical absorptive contrast of the inhomogeneity and the surrounding media is weakly perturbative, and the detector is not near the inhomogeneity . Using linear system theory, a transfer function from the analytic model is derived. This function improves the Fourier optics model by replacing the spherical lens approximation with an exact representation of the system perturbation behavior. The transfer function is shown through simulation to completely characterize the sensitivity of the system to detect and localize in three dimensions inhomogeneities of varying optical contrast with the surrounding media.
DTIC
Light Scattering; Transfer Functions; Analytic Functions; Mathematical Models; Wave Propagation; Inhomogeneity; Spherical Harmonics

19980038159 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Atmospheric Turbulence Scintillation Effects on Wavefront Tilt Estimation
Louthain, James A., Air Force Inst. of Tech., USA; Dec. 1997; 99p; In English
Report No.(s): AD-A336418; AFIT/GE/ENG/97D-11; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

A new atmospheric turbulence screen generator is developed for use in performance calculations of adaptive optics systems valid over a wide range of atmospheric turbulence parameters. The screen generator accounts for diffraction effects caused by weak turbulence and incorporates the phase, amplitude, and cross statistics of the perturbed optical field. The wavefront's phase and amplitude perturbations are taken from the correlation functions developed by Lee and Harp and the cross correlation of the phase and amplitude derived in this thesis. The screen generator uses a modal representation to perform a Fourier series expansion of the wavefront phase and amplitude over a square area. The phase, amplitude, and cross power spectral densities determined from the correlation functions are used in the Fourier series expansion. The mean square value and the structure functions of the phase, amplitude, and cross terms are calculated to within 1% of the theoretical values in a Monte Carlo experiment using the screen generator. Monte Carlo experiments performed using the screen generator showed the amplitude perturbations can significantly reduce the accuracy of full-aperture tilt estimation using image centroid motion. However, since the amplitude perturbations affect the image centroid, the tilt estimate using the combined amplitude and phase screen allows for a higher Strehl ratio than using only the phase to estimate the correction.
DTIC
Atmospheric Turbulence; Scintillation; Wave Fronts; Adaptive Optics; Turbulence Effects

19980039761 MJ Photonics, Inc., Princeton, NJ USA
Synchronization and Timing in All-Optical Networks ***Final Report, Jun. 1996 - Jun. 1997***
Prucnal, Paul R., MJ Photonics, Inc., USA; Oct. 1997; 54p; In English
Contract(s)/Grant(s): F30602-96-C-0174; AF Proj. 4600
Report No.(s): AD-A337688; RL-TR-97-161; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report, a platform design for packet-switching optical time division multiplexed (OTDM) networks operating at ultrafast bit-rates is presented. The design is implemented in a prototype 8-node transparent shuffle network. The flow control in this network is based on a self-routing scheme developed to reduce the address processing delay at each node and make the network

scalable. Deflection routing is used as the contention resolution principle. Several issues on designing optical networks, such as the node configurations and finding the optimal routing algorithm for maximum throughput, are discussed. Subsystem experiments demonstrate the functionality of the components including a 100 Gbps optical packet compressor and a parallel array of Terahertz Optical Asymmetric Demultiplexers (TOADs) used for header address recognition. Precision delay lines are used for synchronization and timing, based on optical self-clocking techniques. The overall capability of the ultrafast packet-switching testbed is evaluated.
DTIC
Optical Communication; Time Division Multiplexing; Communication Networks; Packet Switching; Optical Switching

19980040966 NERAC, Inc., Tolland, CT USA
Optical Transmission. (Latest citations from the Ei Compendex*Plus database)
Jan. 1998; In English
Report No.(s): PB98-852023; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning optical transmission and systems. References cover high speed, high capacity, high reliability, multichannel, and long distance optical transmission. Topics include optical fiber transmission systems, light modulators and amplifiers, optical multiplexing, electromagnetic dispersion, error correction and control, and optical crosstalk. References also discuss optical transmission of semiconductor materials and thin films, wireless access systems, automatic dispersion equalization, network interconnection of cities, and terrestrial and submarine optical links. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Optical Communication

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see90 Astrophysics.

19980037922 Naval Research Lab., Arlington, VA USA
Fast, High Power Microwave Components Based on Beam Generated Plasmas ***Interim Report***
Manheimer, Wallace M., Naval Research Lab., USA; Jan. 19, 1998; 22p; In English
Report No.(s): AD-A336339; NRL/MR/6707--98-8123; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is shown that the agile mirror plasma, under development as a device to simply and cheaply give electronic steering to microwave beams, also has application as a fast, electronically controlled, high power reflector or phase shifter. In a radar system, this can lead to such applications as pulse to pulse polarization agility and electronic control of antenna gain, as well as to innovative approaches to high power millimeter wave circulators.
DTIC
Microwave Equipment; Plasmas (Physics); Beams (Radiation); Electronic Control

19980037923 Naval Research Lab., Washington, DC USA
A Simple Scheme for Implementing Wave Absorption in Quasi-Neutral PIC Simulations of ECR Plasma ***Interim Report***
Manheimer, Wallace M., Naval Research Lab., USA; Jan. 19, 1998; 28p; In English
Report No.(s): AD-A336333; NRL/MR/6707--98-8122; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A simple scheme is formulated here for describing the absorption of electron cyclotron waves in ECR plasma reactors. We particularly focus on quasi-neutral particle simulation schemes, where short times like the inverse electron plasma and cyclotron frequencies are not resolved. The formulation here implements a wave kinetic equation for propagation along the magnetic field and the self consistent quasi-linear response of the electrons. The velocity dependence of the wave deposition is correctly described, maxwell electrons are not assumed so the tail of the electron distribution can be either overpopulated or depopulated, depending on the dominant physical processes present. The computer time to solve the problem and the human time to code it up are both minimized.
DTIC
Wave Equations; Plasmas (Physics); Cyclotron Radiation; Cyclotron Resonance; Electron Distribution; Electron Plasma; Wave Degradation

19980038199 National Inst. for Fusion Science, Nagoya, Japan

Rotation and Oscillation of Nonlinear Dipole Vortex in the Drift-Unstable Plasma

Orito, Kohtaro, Nagoya Univ., Japan; Hatori, Tadatsugu, National Inst. for Fusion Science, Japan; Oct. 1997; ISSN 0915-633X; 20p; In English

Report No.(s): NIFS-511; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The behaviors of the nonlinear dipole vortex in the drift unstable plasma are studied by numerical approaches. Model equations used in numerical simulation are derived from two-fluid model and are composed of two equations with respect to the electrostatic potential and the density perturbation. When the initial dipole vortex is inclined at some angle with respect to the direction of the drift velocity, the dipole vortex oscillates or rotates in the first stage. These phenomenon also happen in the stable system. In the second stage, one part of the dipole vortex grows and another decays because of the destabilization. The shrunk vortex rotates around the enlarged vortex. Consequently, a monopole vortex appears out of the dipole vortex.

Author

Drift Rate; Vortices; Mathematical Models; Dipoles; Two Fluid Models

19980038249 National Inst. for Fusion Science, Nagoya, Japan

On the Stability of Mercier and Ballooning Modes in Stellarator Configurations

Hegna, C. C., Wisconsin Univ., USA; Nakajima, N., National Inst. for Fusion Science, Japan; Oct. 1997; ISSN 0915-633X; 34p; In English

Contract(s)/Grant(s): DE-FG02-86ER-53218

Report No.(s): NIFS-510; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The stability properties of pressure driven ballooning and Mercier modes in general stellarator configurations are studied. A method originally introduced to study tokamak stability by J. M. Greene and M. S. Chance is generalized to three-dimensional systems. This method introduces a way to examine various stability physics mechanisms by using a perturbation theory. Variations in equilibrium quantities are introduced to a localized region whose amplitude is small but whose cross field derivative is large. Consistent with this ordering, changes in the magnetic coordinates and metric elements are calculated using Boozer coordinates. In the general case, the set of equilibria are characterized by two free functions, which are usually chosen to be the local variation of pressure and rotational transform profiles. In this way, a stability space for Mercier and ballooning modes is generated which is parameterized by the average shear and pressure gradient at the magnetic surface of interest. If an additional currentless constraint is imposed, the change in the local rotational transform profile and the local pressure gradient are related; in this limit only one free function parameterizes the set of equilibria. A different way to view the stability information is plot the stability curves in a space parameterized by the local pressure gradient and the field-line-averaged parallel current. When viewed using these plots, it's possible to show that a second stability regime always exists for Mercier modes at sufficiently large pressure gradient.

Author

Stellarators; Ballooning Modes; Numerical Analysis; Magnetohydrodynamic Stability; Three Dimensional Flow

19980038334 Academy of Sciences (USSR), Physical-Technical Inst., Saint Petersburg, USSR

Anomalous Properties of Shocks in Plasma and Reacting Gases ***Final Report***

Basargin, I. V., Academy of Sciences (USSR), USSR; Bedine, Albert P., Academy of Sciences (USSR), USSR; Jan. 1998; 57p; In English

Contract(s)/Grant(s): F61708-97-W-0015

Report No.(s): AD-A338033; SPC-97-4001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Ioffe Physico-Technical Institute of Russian Academy of Sciences as follows: The contractor will investigate anomalous properties of shocks as per his July 94 and June 96 proposals.

DTIC

Plasmas (Physics); Shock Waves

19980039760 Arizona State Univ., Arizona Board of Regents, Tempe, AZ USA

Single Wafer Plasma Reactor Simulator ***Final Report, 16 Mar. 1994 - 15 May 1997***

Kristof, John J., Arizona State Univ., USA; Jul. 25, 1997; 8p; In English

Contract(s)/Grant(s): F49620-94-I-0167

Report No.(s): AD-A337684; AFRL-SR-BL-TR-98-0199; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Single wafer plasma reactor simulator. This information includes details of the objectives of the ASSERT project to optimize single wafer design and operation, and focuses on a protocol known as Programmed Rate Chemical Vapor Deposition. Justifica-

tion for deviation from the original proposal, verification of time savings using this protocol, and transactions communicating and disseminating this protocol to interested parties are discussed. Sections in the report include Accomplishments/New Findings (e.g., the time savings verification), personnel supported, associated personnel, publications, transactions, and interactions explaining the work are also included, as well as future work to which this research could be applied.
DTIC
Plasmas (Physics); Protocol (Computers); Simulators

19980040930 Moscow State Univ., Russia
Experimental and Theoretical Investigation of Discharge Parameters in Conditions of Plasma Aerodynamic Experiment ***Final Report***
Timofeev, Igor B., Moscow State Univ., Russia; Jan. 1998; 97p; In English
Contract(s)/Grant(s): F61708-97-W-0008
Report No.(s): AD-A337646; SPC-97-4002; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
This report results from a contract tasking Moscow State University as follows: The contractor will investigate plasma discharge parameters as per his 14 Jun 96 proposal, with the exception that the contractor will purchase the equipment himself.
DTIC
Plasmas (Physics); Plasma Jets

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SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19980037228 NASA Marshall Space Flight Center, Huntsville, AL USA
Protein Crystal Growth Apparatus for Microgravity
Carter, Daniel C., Inventor, NASA Marshall Space Flight Center, USA; Dowling, Timothy E., Inventor, NASA Marshall Space Flight Center, USA; Jul. 01, 1997; 15p; In English
Patent Info.: Filed 27 Feb. 1995; NASA-Case-MFS-28989-1-GE; US-Patent-5,643,540; US-Patent-Appl-SN-394863; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche
Apparatus for growing protein crystals under microgravity environment includes a plurality of protein growth assemblies stacked one above the other within a canister. Each of the protein growth assemblies includes a tray having a number of spaced apart growth chambers recessed below an upper surface. the growth chambers each having an upstanding pedestal and an annular reservoir about the pedestal for receiving a wick and precipitating agents. A well is recessed below the top of each pedestal to define a protein crystal growth receptacle. A flexible membrane is positioned on the upper surface of each tray and a sealing plate is positioned above each membrane, each sealing plate having a number of bumpers corresponding in number and alignment to the pedestals for forcing the membrane selectively against the upper end of the respective pedestal to seal the reservoir and the receptacle when the sealing plate is forced down.
Official Gazette of the U.S. Patent and Trademark Office
Protein Crystal Growth; Microgravity; Technology Assessment; Spaceborne Experiments

19980037663 North Carolina State Univ., Raleigh, NC USA
SiC Discrete Power Devices-Analysis and Optimization of the Planar 6H-SiC ACCUFET; A Planar Lateral Channel SiC Vertical High Power JFET; The Planar Lateral Channel MESFET-A New SiC Vertical Power Device; Growth via Hot Wall Chemical Vapor Deposition ***Annual Report, 15 Jan. 1997 - 15 Jan. 1998***
Davis, R. F., North Carolina State Univ., USA; Baliga, B. J., North Carolina State Univ., USA; Tomozawa, H. S., North Carolina State Univ., USA; Shenoy, P. M., North Carolina State Univ., USA; Jan. 15, 1998; 51p; In English
Contract(s)/Grant(s): N00014-96-I-0363-1
Report No.(s): AD-A335240; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A novel planar accumulation channel SiC MOSFET structure is reported. The problems of gate oxide rupture and poor channel conductance previously reported in SiC UMOSFETs are solved by using a buried P+ layer to shield the channel region. The fabricated 6H-SiC unterminated devices had a blocking voltage of 350 V with a specific on-resistance of 18 m ohms-sq cm at room temperature for a gate bias of only 5 V. This measured specific on-resistance is within 2.5X of the value calculated for the epitaxial drift region (10(exp 16) /cu cm, 10 micrometers), which is capable of supporting 1500 V. In addition, a novel planar lateral channel SiC high power JFET is described. Two-dimensional numerical simulations predicted low on-resistances with excellent current

saturation and square FBSOA, which have been experimentally confirmed. A novel planar lateral channel SiC MESFET structure with vertical current flow in the drift region is also proposed and demonstrated by modeling and fabrication. A hot wall chemical vapor deposition system has been constructed for the growth and doping of 6H- and 4H-SiC thin films at very high temperatures and high growth rates. The design incorporates a separate load lock to which a growth chamber and a RHEED chamber are attached.
DTIC
Silicon Carbides; Vapor Deposition; Field Effect Transistors; Fabrication

19980038126 NASA Marshall Space Flight Center, Huntsville, AL USA
Bulk Growth of Wide Band Gap II-VI Compound Semiconductors by Physical Vapor Transport
Su, Ching-Hua, NASA Marshall Space Flight Center, USA; International Society for Optical Engineering; 1997; ISSN 0277-786X; Volume 3123, pp. 7-21; In English; Materials Research in Low Gravity, 28-29 Jul. 1997, San Diego, CA, USA
Report No.(s): NASA/TM-97-207367; NAS 1.15:207367; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mechanism of physical vapor transport of II-VI semiconducting compounds was studied both theoretically, using a one-dimensional diffusion model, as well as experimentally. It was found that the vapor phase stoichiometry is critical in determining the vapor transport rate. The experimental heat treatment methods to control the vapor composition over the starting materials were investigated and the effectiveness of the heat treatments was confirmed by partial pressure measurements using an optical absorption technique. The effect of residual (foreign) gas on the transport rate was also studies theoretically by the diffusion model and confirmed experimentally by the measurements of total pressure and compositions of the residual gas. An in-situ dynamic technique for the transport rate measurements and a further extension of the technique that simultaneously measured the partial pressures and transport rates were performed and, for the first time, the experimentally determined mass fluxes were compared with those calculated, without any adjustable parameters, from the diffusion model. Using the information obtained from the experimental transport rate measurements as guideline high quality bulk crystal of wide band gap II-VI semiconductor were grown from the source materials which undergone the same heat treatment methods. The grown crystals were then extensively characterized with emphasis on the analysis of the crystalline structural defects.
Author
Vapor Phases; Broadband; Semiconductors (Materials); Heat Treatment; Gas Transport; Electromagnetic Absorption; Residual Gas

19980038145 NASA Marshall Space Flight Center, Huntsville, AL USA
Seeded Physical Vapor Transport of Cadmium-Zinc Telluride Crystals: Growth and Characterization
Palosz, W., NASA Marshall Space Flight Center, USA; George, M. A., Tennessee Univ., USA; Collins, E. E., Tennessee Univ., USA; Chen, K.-T., NASA Marshall Space Flight Center, USA; Zhang, Y., Tennessee Univ., USA; Burger, A., Tennessee Univ., USA; Journal of Crystal Growth; 1997; ISSN 0022-0248; Volume 174, pp. 733-739; In English
Report No.(s): NASA/TM-97-207738; NAS 1.15:207738; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Crystals of Cd(1-x)Zn(x)Te with x = 0.2 and 40 g in weight were grown on monocrystalline cadmium-zinc telluride seeds by closed-ampoule physical vapor transport with or without excess (Cd + Zn) in the vapor phase. Two post-growth cool-down rates were used. The crystals were characterized using low temperature photoluminescence, atomic force microscopy, chemical etching, X-ray diffraction and electrical measurements. No formation of a second, ZnTe-rich phase was observed.
Author
Cadmium Tellurides; Zinc Tellurides; Ternary Alloys; Crystal Growth; Etching; Photoluminescence

19980038198 Academy of Sciences of the Moldavian SSR, Laser Research Lab., Kishinev, Moldova
CdF2:Er(3+)/Si(111) Heterostructure For EL Displays *Final Report*
Pyshkin, Sergei, Academy of Sciences of the Moldavian SSR, Moldova; Jan. 1997; 31p; In English
Contract(s)/Grant(s): F61708-97-W-0063
Report No.(s): AD-A336511; EOARD-SPC-97-4011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Institut of Applied Physics as follows: The contractor will investigate state of the art, experimental facilities and growth methods for Cdf2:Er(3+)/CaF2/Si(111) as well as (Ca, SR, Ba)F2/Si(Ge) heterostructures for potential applications in the design and development of electroluminescent display technology. Samples of the prepared mate-

rials (2-4) will be presented to the customer as well as all of the related procedures of pretreatment, growth, and characterization. The entirety of the described work will be documented in a final report as well as interim joint papers.
DTIC
Fluorides; Molecular Beam Epitaxy; Electroluminescence; Photoluminescence; Cathodoluminescence

19980038368 North Carolina State Univ., Dept. of Materials Science and Engineering, Raleigh, NC USA
Growth, Characterization and Device Development in Monocrystalline Diamond Films ***Quarterly Report, 1 Oct. - 31 Dec. 1997***
Davis, R. F., North Carolina State Univ., USA; Nemanich, R. J., North Carolina State Univ., USA; Sitar, Z., North Carolina State Univ., USA; Baumann, P. K., North Carolina State Univ., USA; Liu, W., North Carolina State Univ., USA; Dec. 1997; 70p; In English
Contract(s)/Grant(s): N00014-93-I-0437
Report No.(s): AD-A337739; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The growth of coalesced, highly-oriented diamond films has been achieved on nickel substrates using a multi-step process consisting of (1) seeding the Ni surface with 0.5 microns diamond powder, (2) annealing at 1100 deg C in a hydrogen atmosphere, and (3) growth at 900 deg C in a mixture of hydrogen and 0.5% methane. An addition of 0.5% methane in the gas phase produced optimum results, as the nucleation density, orientation of diamond particles, and uniformity were substantially improved. Substrates nucleated under these conditions were grown out into coalesced, 30 microns thick films. Both (100) and (111) oriented films showed a high degree of orientation and Raman spectra obtained from these orientations showed intense and narrow diamond signature peaks with FWHMs of 5 and 8/cm, respectively. Nitrogen-doped diamond was deposited by microwave plasma CVD for cold cathode applications and characterized by laser reflectance interferometry, Raman and photo luminescence spectroscopies, and field emission measurements. Initially growth rates of diamond films were enhanced by nitrogen addition, but further nitrogen addition caused a decrease in the growth rate and eventually no diamond deposition was observed for N/C gas phase ratios greater than 70. Raman scattering spectroscopy indicated a decrease in film quality with nitrogen doping. Field emission measurements indicate threshold fields of 70-90 V/mm independent of process conditions. It was also observed that hydrogen leads to a negative electron affinity (NEA) on diamond (100) surfaces while oxygen termination and adsorbate free surfaces exhibit a positive electron affinity. Zirconium deposited on clean and oxygen- or hydrogen containing diamond (100) surfaces also exhibited an NEA.
DTIC
Diamond Films; Raman Spectra; Crystal Growth; Vapor Deposition; Nitrogen

19980040936 Parke Mathematical Labs., Inc., Lowell, MA USA
Establish Methods for Crystal Growth of Si-Ge ***Final Report, Aug. 1995 - Feb. 1997***
Adamski, Joseph A., Parke Mathematical Labs., Inc., USA; Bailey, John S., Parke Mathematical Labs., Inc., USA; Oct. 1997; 16p; In English
Contract(s)/Grant(s): F19628-95-C-0172; AF Proj. 2300
Report No.(s): AD-A337685; RL-TR-97-170; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The SiGe alloy system will result in a whole new set of high performance electronic and optoelectronics devices, such as, thermoelectric generators, infrared detectors, and high speed optical transmitter-receivers. The production of high speed SiGe devices has been limited by thin-film alloy growth techniques which are compatible with silicon substrates. The alloy composition of thin films is limited because of strain between the substrate and the thin film. This contractual effort is aimed at producing bulk alloy SiGe crystals of uniform composition for use as substrates. These new substrates will expand the range of lattice-matched thin film alloys available for development of high speed SiGe devices. SiGe alloy electronic devices offer some advantages over III-V and II-VI compound semiconductors Their chemical and thermo-mechanical. properties will allow them to be closely compatible with established Si processing techniques and Si integrated circuits.
DTIC
Thermoelectric Generators; Thin Films; Semiconductors (Materials); Metal Films; Integrated Circuits; Crystal Growth

19980040979 North Carolina State Univ., Raleigh, NC USA
Research Related to the Development, Fabrication and Characterization of UV Detectors and Cold Cathode Devices, ***1 Jan. - 31 Dec. 1997***
Davis, R. F., North Carolina State Univ., USA; Dec. 1997; 48p; In English
Contract(s)/Grant(s): N00014-96-I-0765
Report No.(s): AD-A337629; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The microstructure and the mechanism of lateral epitaxy overgrowth (LEO) of homoepitaxially and selectively grown GaN pyramid structures on GaN/AlN/6H-SiC(0001) substrates and within windows in SiO2 masks have been investigated by transmission electron microscopy (TEM) and scanning electron microscopy (SEM). The structures were produced by organometallic vapor phase epitaxy (OMVPE) for field emission studies. The SiO2 film provided an amorphous stage on which lateral growth of the GaN occurred. Essentially no GaN deposited on the SiO2 because of the substantial differences in sticking coefficients of Ga and N species on GaN (s=l) and SiO2 (s approx. 0). LEO of GaN layers has been achieved on 3 micrometers wide and 7 micrometers spaced stripe windows contained in SiO2 masks. A high density of threading dislocations, originating from the interface of the underlying GaN with the AlN buffer layer, were contained in the GaN grown in the window regions. The overgrowth regions, by contrast, contained a very low density of dislocations. The second lateral epitaxial overgrowth layers were obtained on the first laterally grown layers by the repetition of SiO2 deposition, lithography and lateral epitaxy. A GaN and Al(x)Ga(1-x)N thin film MODFET structure was grown for Northrup Grumman. The microstructures and photoluminescence spectra have been determined for In(x)Ga(1-x)N films (x less than or equal to approx. 0.23) grown on substrates of alpha(6H)-SiC(0001) wafer/AlN buffer layer/GaN heterostructures by low pressure OMVPE at 780 deg C using nitrogen as the diluent and carrier gas and V/III ratios as low as 2,420. Indium droplets were not observed.
DTIC
Ultraviolet Detectors; Cold Cathode Tubes; Low Pressure; Organometallic Compounds; Electron Microscopy

80
SOCIAL SCIENCES (GENERAL)

Includes educational matters.

19980039759 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1996, Interdisciplinary Academic Groups
Boger, Dan C., Naval Postgraduate School, USA; Levien, Fred, Naval Postgraduate School, USA; Panholzer, Rudolf, Naval Postgraduate School, USA; Eagle, James, Naval Postgraduate School, USA; Ching-Sang, Chui, Naval Postgraduate School, USA; Nov. 1997; 87p; In English
Report No.(s): AD-A337653; NPS-09-97-014; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report contains summaries of research projects in the Interdisciplinary Academic Groups. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis reports.
DTIC
Research Management; Conferences

19980040284 NASA Lewis Research Center, Cleveland, OH USA
Fastener Design Course
Barrett, Richard T., NASA Lewis Research Center, USA; Jun. 1997; 284p; In English; Set of 9 Videotapes: 7 hrs., playing time, in color, with sound
Report No.(s): NASA/TM-1997-207862; NONP-NASA-VT-1998118421; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche; A02, Videotape-VHS; A22, Videotape-Beta
Richard T. Barrett, Senior Aerospace Engineer of NASA Lewis Research Center presents a comprehensive course on fastener design. A recognized expert in the field of fastener technology Mr. Barrett combines lecture, charts, illustrations with real-world experiences. Topics covered include: materials, plantings and coatings, locking methods threads, joint stiffness, rivets, inserts, nut plates, thread lubricants, design criteria, etc. A workbook accompanies the videotape.
Author
Lectures; Fasteners; Design Analysis

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

19980037589 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Best Practices: Elements Critical to Reducing Successfully Unneeded RDT and E Infrastructure. Report to Congressional Requesters
Jan. 1998; 94p; In English
Report No.(s): AD-A334855; GAO/NSIAD/RCED-98-23; B-277529; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report, in laying out a framework within which changes to the federal RDT&E infrastructure can be accomplished and around which debate about the need for those changes can occur, (1) examines the condition of existing infrastructure, (2) analyzes the approaches used by organizations outside of the federal government to realign RDT&E infrastructure, and (3) compares those approaches to federal agency efforts. This approach, if implemented fully by federal agencies, could help focus agencies' efforts in research and development, reduce unneeded infrastructure government-wide, and free up resources necessary for scientific programs and related equipment.
DTIC
Governments; Research and Development; Congressional Reports

19980038240 Iowa Univ., Dept. of Management Sciences, Iowa City, IA USA
Coordinating Information and Decisions of Hierarchical Distributed Decision Units in Crises ***Final Report***
Rose, Gerald L., Iowa Univ., USA; Aug. 1997; 104p; In English
Contract(s)/Grant(s): MDA903-90-C-0154; Proj. B74F
Report No.(s): AD-A336263; ARI-97-24; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A program of research is described. The research addressed decision making by distributed decision makers using either consensus or leader structures and confronted by both routine tasks and different kinds of information system crisis. There were three phases--a macro combining published empirical research, a simulation, and experimentation. The first phase documented that experimental research can offer very limited guidance for administrators as it only rarely investigates groups, and never organizations, in crises. The second phase exposed the challenges of combining simulations of individual (e.g., cognitive), group, organizational, environmental, and task properties as a strategy for guiding future experimental research. The third phase extended the capabilities of an organizational simulator and used it as a testbed for experiments. The simulator uses networked personal computers for all communications and records all communications and transactions between team members. Despite training in the simulator prior to experiments, participants failed to effectively exploit potential crisis response capabilities. Results suggest the importance of expanding systemic perspectives and practice with short-term redesign of available systems for people who work in distributed decision environments subject to crises. Experience with the simulator also suggested guidelines for future experiments on pseudo-organizations.
DTIC
Decision Making; Information Systems; Environments; Organizations; Test Stands

19980040038 Air Force Inst. of Tech., Graduate School of Logistics and Acquisition Management, Wright-Patterson AFB, OH USA
A Comparison of the Decision Quality of Group Decisions Made in a Face-to-Face Environment with Decisions Made Using a Distributed Group Decision Support System
Cullen, Hope D., Air Force Inst. of Tech., USA; Dec. 1997; 72p; In English
Report No.(s): AD-A335178; AFIT/GIR/LAS/97D-13; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Air Force is increasingly turning to a team approach for decision making. When team members are geographically separated it can be expensive for them to meet in a traditional face to face setting. Group Decision Support Systems (GDSS), designed to help groups make decisions, may be able to support these groups in a distributed mode. The assertion of this thesis is that a GDSS can indeed support such distributed processes and that these processes will be of higher quality than decisions made in a face to face environment. This study explores decision quality in terms of quality of the outcome, and acceptance of the decision by group participants. Through a laboratory experiment, groups of three or four members met to solve a management problem. Results suggest that quality of the decision depends upon the type of group interaction, the order of that interaction and the scenario difficulty. The analysis found no statistically significant difference for decision quality in either type of group interaction. Additional

research is necessary to examine the potential for Air Force use of distributed GDSS to reduce travel costs without reducing decision quality.
DTIC
Group Dynamics; Decision Making; Armed Forces (USA)

19980040071 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Best Practices: Elements Critical to Successfully Reducing Unneeded RDT and E Infrastructure
Jan. 1998; In English
Report No.(s): AD-A336637; GAO/NSIAD/RCED-98-23; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

This report, in laying out a framework within which changes to the federal RDT&E infrastructure can be accomplished and around which debate about the need for those changes can occur: (1) examines the condition of existing infrastructure, (2) analyzes the approaches used by organizations outside of the federal government to realign RDT&E infrastructure, and (3) compares those approaches to federal agency efforts. This approach, if implemented fully by federal agencies, could help focus agencies' efforts in research and development, reduce unneeded infrastructure governmentwide, and free up resources necessary for scientific programs and related equipment.
DTIC
Organizations; Procedures; Research Facilities; Congressional Reports

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

19980037581 Princeton Univ., Dept. of Psychology, NJ USA
Understanding Metaphorical Use of Verbs *Final Report*
Torreano, Lisa A., Princeton Univ., USA; Jun. 1997; 131p; In English
Report No.(s): AD-A334682; AFRL-SR-BL-TR-98-0019; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

How do people understand language in which verbs are used metaphorically? For example, how do people understand utterances such as He bathed in her beauty or She punctured his ego in everyday conversation? The general cognitive processes and discourse strategies described by the interactive attributive model (Ulucksberg & Keysar, 1990; Glucksberg, McGlone, & Manfredi, 1997) are investigated as a possible base for a cogent model of metaphorical verb use. Specifically, the use of the dual reference strategy of using the name of a category instance to name the category itself is investigate d for verbs. Experiment 1 investigated factors that influence judgments of metaphoricity. Ratings of metaphors (e.g., The car flew across the intersection) suggest that verbs are interpreted metaphorically when their selection restrictions are violated. For example, the verb to fly normally (literally) takes subjects that are capable of air travel, such as birds or airplanes. When this restriction is violated (e.g., cars or ideas flying), the verb is judged as being used metaphorically. Furthermore, the degree of metaphoricity is a function of the degree of violation. Experiment 2 used a priming paradigm to test whether verbs can be used to make dual reference to either a literal action referent or to a generalized action category referent which it typifies. Different uses of verbs in either metaphorical (e.g., The idea flew) or literal (e.g., The bird flew) contexts, resulted in differential accessibility of action properties. For example. properties relevant to understanding the metaphor, such as flying is fast, are more accessible after metaphors than literal statements. Conversely, properties that are irrelevant to understanding the metaphor, such as flying is air travel, are less accessible after metaphors than literal controls.
DTIC
Languages; Communication Theory; Verbal Communication

19980037949 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
The One with the Most Information Wins? The Quest for Information Superiority
Clements, Stacy M., Air Force Inst. of Tech., USA; Dec. 1997; 140p; In English
Report No.(s): AD-A335235; AFIT/GIR/LAL/97D-5; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The escalation of interest in information as a corporate resource is reflected in the military's quest for information superiority. A volume of directives, articles, and doctrine is appearing to meet the unique challenges presented by information as a resource.

Discussions of how to achieve information superiority have given rise to investigations of such related concepts as information warfare and information operations, with associated taxonomies and ideas of how to use information capabilities for attack and defense. This thesis examines information superiority and the related concepts, and examines current information technology initiatives in order to discern the characteristics which can aid in the quest for information superiority. A synthesis of the most prominent perspectives on information superiority is formed. In the context of this definition, a process model of information superiority and its necessary activities is developed, with acquisition and decision making identified as key. The idea of information technology as enabling information superiority is probed, and an alternate view proposed; contending that information technology is more likely to be detrimental to information superiority unless certain criteria are met. The resulting conceptual model depicts the key attributes of information superiority and information technology, and represents the relationships between these concepts.
DTIC
Information Transfer; Information Systems; Decision Making

19980037950 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
An Examination of Multi-Tier Designs for Legacy Data Access
Acker, Michael L., Air Force Inst. of Tech., USA; Dec. 1997; 151p; In English
Report No.(s): AD-A335233; AFIT/GCS/ENG/97D-01; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This work examines the application of Java and the Common Object Request Broker Architecture (CORBA) to support access to remote databases via the Internet. The research applies these software technologies to assist an Air Force distance learning provider in improving the capabilities of its World Wide Web-based correspondence system. An analysis of the distance learning provider's operation revealed a strong dependency on a non-collocated legacy relational database. This dependency limits the distance learning provider's future web-based capabilities. A recommendation to improve operation by data replication is proposed, and the implementation details are provided for two alternative test systems that support data replication between heterogeneous relational database management systems. The first test system incorporates a two-tier architecture design using Java, and the second system employs a three-tier architecture design using Java and CORBA. Data on replication times for the two-tier and three-tier designs are presented, revealing a greater performance consistency from the three-tier design over the two-tier design for varying client platforms and communications channels. Discussion of a small-scale proof-of-concept system based on the three-tier design is provided, along with a presentation of the potential for the technologies applied in this system to benefit Air Force web-based distance learning.
DTIC
Design Analysis; Data Base Management Systems; Data Bases; Data Processing; Data Management; Channels (Data Transmission); Distributed Processing

19980038143 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Security for Information Technology Service Contracts ***Final Report***
Jan. 1998; 39p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A336329; CMU-SEI-SIM-003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An increasing number of organizations are contracting with outside companies for installation and maintenance of their information technology (IT). All too often, these organizations experience increased difficulty in providing appropriate oversight of the services and software for which they have contracted. For example, contractor access to the organization's systems is often neither well controlled nor secure, placing information systems and data at risk. The practices recommended in this document are designed to assist your organization in managing the contractor, managing the contract, and deterring common, known security problems when IT services and software are externally contracted.
DTIC
Information Systems; Security; Services; Information Management

19980038257 Office of the Under Secretary of Defense for Research and Engineering, Washington, DC USA
DoD Scientific and Technical Information (STI) Program (STIP)
Feb. 11, 1998; 5p; In English
Report No.(s): AD-A336281; DODD-3200.12; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This Directive: 1. Reissues reference (a) to update DoD policy and responsibilities consistent with the general authority of the Secretary of Defense under reference (b) for establishing the DoD STIP. 2. Authorizes the issuance of reference (c), consistent with reference (d), to provide guidance on implementation of policies and principles for the DoD STIP. 3. Authorizes the issuance of DoD Instruction 3204.1 (reference (e)), consistent with reference (d), to provide implementation of policy and principles for

the DoD Industry Independent Research and Development Program. 4. Authorizes the issuance of DoD 3200.12-R-4 (reference (f)), consistent with reference (d) to provide guidance for the implementation of policy and principles for the DoD Domestic Technology Transfer Program.
DTIC
Information Systems; Information Transfer; Research and Development; Documents

19980038271 Open Software Foundation, Inc., Cambridge, MA USA
Wide Area Information Browsing Assistance ***Final Report, Jun. 1994 - Feb. 1997***
Brooks, Charles L., Open Software Foundation, Inc., USA; Davidson, Misha B., Open Software Foundation, Inc., USA; Oct. 1997; 97p
Contract(s)/Grant(s): F30602-94-C-0209; AF Proj. B323
Report No.(s): AD-A336733; RL-TR-97-145; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
This report contains information from the work performed under the Wide Area Browsing Assistance (WAIBA) contract to investigate the design of novel, intuitive environments for using the web maintaining notions of location independent information and emphasizing the web's use by collaborative teams. The WAIBA effort is also the basis for graphical annotation work currently under the development as part of the DARPA Sponsored Advanced Logistics Planning (ALP) program.
DTIC
Information Retrieval; World Wide Web

19980038351 Air Force Academy, CO USA
Testbank 3.1 User's Manual ***Final Report***
Hadfield, Steven M., Air Force Academy, USA; Nov. 1997; 60p; In English
Report No.(s): AD-A337543; USAFA-TR-97-9; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This user's manual describes the operation and maintenance of the Testbank 3.1 database application software. Testbank 3.1 provides for the automated development of high quality tests by retaining and providing for the efficient retrieval of previously used test questions with the results of their usage. In addition to providing a measure of the questions' quality, this data is usefull in the assessment of student performance across offerings of the course. Testbank 3.1 is an application program written run under the Microsoft Access 97 database management system within the Office 97 environment.
DTIC
User Manuals (Computer Programs); Software Engineering; Maintenance; Applications Programs (Computers)

19980038366 Knowledge Based Systems, Inc., College Station, TX USA
Accomplishments and Opportunities Report Information Integration for Concurrent Engineering ***Final Report, Feb. 1991 - Sep. 1995***
Mayer, Richard, Knowledge Based Systems, Inc., USA; Painter, Michael, Knowledge Based Systems, Inc., USA; Menzel, Christopher, Knowledge Based Systems, Inc., USA; Blinn, Thomas, Knowledge Based Systems, Inc., USA; Benjamin, Perakath, Knowledge Based Systems, Inc., USA; Sep. 1997; 349p; In English
Contract(s)/Grant(s): F33615-90-C-0012; AF Proj. 2940
Report No.(s): AD-A337580; AL/HR-TP-1996-0028; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche
This document provides an overview and describes the results of the Information Integration for Concurrent Engineering (IICE) project, a four-year program sponsored by the Armstrong Laboratory Logistics Research Division. This program provides the foundations, methods, and tools to effectively implement and evolve toward an information-integraed concurrent engineering environment. In the context of information integration, "information systems' are systems which include both automated and non-automated components responsible for capturing, managing, and controlling IICE information resources. The IICE program investigated information integration concepts supporting this broad definition through eight technical thrusts: Integrated Systems Theory, Three-Schema Architecture, Experimental Tools, Ontology, Frameworks, Methods Engineering, Applications, and Technology Transfer thrusts. In this report, each of these thrusts are discussed in detail, beginning with the goals and objectives of the thrust, the relationship of the thrust to other IICE thrusts, and a summary of the significant accomplishments achieved in the thrust This introduction is then followed by a detailed discussion of the philosophy surrounding each thrust and the technical results derived from each.
DTIC
Data Bases; Software Engineering; Concurrent Engineering; Information Systems

19980039762 Princeton Univ., NJ USA

Analysis of the Organization of Lexical Memory ***Interim Report***

Miller, George A., Princeton Univ., USA; Sep. 1997; 9p; In English

Contract(s)/Grant(s): MDA903-86-K-0242; B74F61102C26

Report No.(s): AD-A337809; ARI-RN-97-32; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The practical outcome of the project, Analysis of the Organization of Lexical Memory, is an electronic lexical database called WordNet that can be incorporated into computer systems for processing English text. WordNet includes approximately 45,000 lexicalized concepts, providing a coverage equivalent to a hand held dictionary. The database has three components, one each for nouns, verbs, and adjectives. The semantic relations that organize each component are different, but in general a lexicalized concept is represented by a set of synonyms that can be used to express the concept, the familiar semantic relations are represented by labeled pointers between synonyms sets. In order to create the database, programs were written to write and edit lexical files, to convert lexical files into database, to search the database, to strip inflections from search requests, and to display retrieved information for a user. Three user interfaces have been developed for WordNet. (1) The simplest is a command line version that does not require a windowing system and can run on standard monitors. (2) A browser written for Sun View and for X-11 windows is intended for use with an on-line dictionary; by using WordNet, the dictionary can be searched conceptually as well as alphabetically. (3) A lexical filter written for X-11 windows catches unfamiliar words in a text file and suggests alternative expressions that an author may wish to choose.

DTIC

Data Bases; Words (Language); Natural Language (Computers); Natural Language Processing

19980040037 Air Force Inst. of Tech., Graduate School of Logistics and Acquisition Management, Wright-Patterson AFB, OH USA

Information Resource Management: An Analysis of the Critical Skills, Training Sources, and Training Adequacy as Perceived by Air Force communications and Information Officers

Schmidt, Donald A., Air Force Inst. of Tech., USA; Dec. 1997; 150p; In English

Report No.(s): AD-A335176; AFIT/GHR/LAS/97D-12; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study explores what Information Resource Management (IRM) skills are required as perceived by the Air Force officers performing IRM duties. The following questions set the stage for this research: (1) What does current literature say about the required skills needed for IRM professionals? (2) What IRM skills do officers in the field perceive as important to the IRM mission? (3) What is the primary source of any IRM training received by the officers? (4) How adequate was this training, if any? The results suggest that Air Force officers have a grasp of IRM concepts and know what skills are necessary to perform the mission successfully. This study also revealed that formal training received by the officers is adequate or better. This completes two pieces of the puzzle: (1) What skills are needed to complete the mission, and (2) The formal methods of training are effective and adequate. The third piece of the puzzle has not been realized. More people need access to formal training sources. It does not matter how good the training is if no one has the opportunity to attend. As the Air Force leads the way into the information age, people must be trained to manage the criticality resource information.

DTIC

Information Management; Resources Management; Armed Forces (USA)

19980040081 Columbia Univ., New York, NY USA

A Wavelet Fractal Method for Content Based Image and Video Compression

Bonneau, Robert J., Columbia Univ., USA; Jan. 30, 1998; 166p; In English

Report No.(s): AD-A336873; Rept-97-040D; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Traditional methods of image and video coding rely on linear transformations that focus primarily on high compression. With the increasing demand for digital imagery and video there is now a need for functionality of the compressed information. This dissertation develops a new framework for compression that uses a fractal wavelet method to break the imagery into shape, texture, color, and motion. With this new organization, image information is readily accessible to the user in compressed form. Based on this compression method, we then develop an object-oriented video format. Image analysts tend to break imagery into the categories of shape, texture, color, and motion. Thus, we begin our approach to image compression by finding mathematical methods that preserve shape and texture in an efficient manner. This new non-traditional method begins by using fractals. A fractal is an object which when observed at its smallest level of detail resembles the overall object itself. Some natural examples include ferns, snowflakes, clouds, and mountains. Recently, engineers have applied fixed point theory to describe a method of fractal image

compression. Unfortunately fixed point theory only provides a partial description of fractal compression, since it says little about the spatial frequency structure behind the process.
DTIC
Wavelet Analysis; Image Processing; Video Compression; Fractals

19980040939 Army Training and Doctrine Command, Fort Monroe, VA USA
TRADOC Plan for Reengineering Information Systems Modernization, TPRISM
Oct. 01, 1997; 129p; In English
Report No.(s): AD-A337725; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Training and Doctrine Command's (TRADOC) core processes and products will continue to be information based. TRADOC will acquire information from worldwide external sources as well as from our own operations and experiments. TRADOC will analyze and process information to formulate new concepts, doctrine, organizational designs and materiel requirements. to create consensus for our products, TRADOC will transport information to worldwide destinations. to ensure products have a combined arms orientation and integrated intellectual content, TRADOC will require frequent, and sometimes large, information exchanges, internal and external to the command. While TRADOC will generate and package its products various ways, e.g., doctrine as publications and computer media materiel requirements as documents and demonstrations; training as institutional training lectures, videos and interactive courseware --their common denominator will be their information content. In short, TRADOC's mission will keep the command squarely in the information management (IM) business.
DTIC
Information Management; Information Systems

19980040952 Lockheed Martin C2 Integration Systems, Advanced Software Research/Advanced Information Systems, Paoli, PA USA
Persistent Storage Technology for Planning and Scheduling ***Final Report, Apr. 1993 - Jun. 1996***
Pastor, Jon A., Lockheed Martin C2 Integration Systems, USA; McKay, Donald P., Lockheed Martin C2 Integration Systems, USA; McEntire, Robin, Lockheed Martin C2 Integration Systems, USA; Oct. 1997; 107p; In English
Contract(s)/Grant(s): F30602-93-C-0028; AF Proj. A007
Report No.(s): AD-A337920; ARPA-TR-97-112; RL,XC-ARPA; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Knowledge-based systems can provide a key information processing aid to operational planning, scheduling and monitoring of operations. Specifically, these systems can provide key information support for current deficiencies in crisis action planning for transportation logistics. Requirements for these systems include the ability to access, manipulate, and modify the information stored in existing databases, and a high level of collaborative and cooperative processing with the other planning agents including people and software components. Within the DARPA/Rome Lab Planning Initiative (ARPI), an intelligent information services architecture has been demonstrated which integrated cooperative user interaction and integrated information location via domain/user-oriented object representations. This effort involving participants and software components developed by Lockheed Martin, USC 151 and UCA demonstrated an experimental prototype operating in real time over the internet capable of providing information satisfying user requests making transparent to the user: (1) query relaxation and reformulation despite over-specific queries and lack of data, (2) location and selection of information sources based upon multiple selection criteria, (3) transformation of low-level data source information from databases into domain and user relevant information structures, and (4) the query language utilized. Internal communications over the internet were implemented using KQML, the Knowledge Query and Manipulation Language, a DARPA-sponsored emerging language and protocol for information exchange.
DTIC
Knowledge Based Systems; Data Storage; Data Processing; Expert Systems

19980040959 NERAC, Inc., Tolland, CT USA
Optical Character Recognition. (Latest citations from the NTIS Bibliographic Database)
Mar. 1998; In English
Report No.(s): PB98-853427; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning technology reviews, developments, and applications of optical character recognition techniques and equipment. Topics include specific systems descriptions and evaluations, theoretical aspects, and

appropriate industry standards. Applications include postal system studies, data entry, and cartography. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Character Recognition; Bibliographies

19980041216 Naval Postgraduate School, Monterey, CA USA
Hypermedia Analysis and Navigation of Domains
Lange, Douglas S., Naval Postgraduate School, USA; Sep. 1997; 116p; In English
Report No.(s): AD-A336752; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Hypermedia systems have been demonstrated to support authoring and reading of mostly static information. Few systems address the needs of analysts deriving information from a continuously changing base of information. Those that do, focus on the existing content and use links primarily for navigation and management. An open hypermedia architecture is proposed for a class of analysis systems where the value added by the analyst is through associating data elements. In such systems, links are the primary form of information being managed. The architecture developed provides a framework through which hypermedia analysis systems can be generated with little or no code development. Specifically, the model is shown to apply to the domain of software engineering by mapping the analysis portions of a rapid prototyping lifecycle to a schema defined using the framework. Through the addition of n-ary links and links to links, the architecture provides a closer mapping to the Dexter Hypertext Reference Model than current graph-based models such as the Multimedia Object Retrieval Environment (MORE). Improvements over MORE are also shown in the use of abstraction as a filtering mechanism and through the full involvement of links as being the primary focus of the analysis, query, and filtering functions.
DTIC
Information Systems; Computer Programs; Multimedia

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

19980038153 Office of Aerospace Studies, Kirtland AFB, NM USA
Top Level Space Cost Methodology (TLSCM) ***Final Report***
Scarborough, Truett L., Office of Aerospace Studies, USA; Dec. 02, 1997; 55p; In English
Report No.(s): AD-A336360; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A compilation of Life Cycle Cost (LCC) methodologies and techniques that will lead an inexperienced 'coster' (one who estimates cost) step by step to devise a Rough Order of Magnitude (ROM) LCC estimate. The inexperienced coster is shown where and how to begin. The space arena was chosen to illustrate the methodologies by estimating theoretical examples. The LCC estimates presented illustrate space systems, but the same methodologies can be used with conventional ground or airborne systems. The examples portray only a top-level, back-of-the-envelope, quick-turn around LCC estimate that can be used by 'top level' decision makers. Since the objective of the 'top level' cost estimates takes CAIV into account, this document will be helpful prior to Milestone 0 and Milestone I in the system acquisition life cycle. The examples only go to work breakdown structure level 2. References are given and the coster is shown how to document and report LCC IAW DOD 5000.4M. Also, readers are warned about some common costing traps that can easily occur. An inflation tutorial instructs how to convert the cost of one fiscal year to another. The document has limited potential for a seasoned, well experienced coster.
DTIC
Cost Estimates; Life Cycle Costs; Technologies

19980040049 University of Central Florida, Dept. of Psychology, Orlando, FL USA
Team Training and Performance Research: A Ten-Year Review ***Final Report, Sep. 1992 - Dec. 1994***
Bowers, Clint A., University of Central Florida, USA; Weaver, Jeanne L., University of Central Florida, USA; Urban, Julie M., University of Central Florida, USA; Morgan, Ben B., Jr., University of Central Florida, USA; May 1997; 147p; In English
Contract(s)/Grant(s): DAAL03-91-C-0034
Report No.(s): AD-A335775; ARI-RN-97-12; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The military has become dependent upon the performance of teams for many critical tasks. Consequently, there is a clear need to understand the nature of team performance to develop training interventions for use in ensuring effective military teams. Unfortunate ly, the scientific literature regarding team performance has provided little guidance regarding the nature of team perfor-

mance or the most efficacious paradigms for team training. Since Dyer's review (1984)10 years ago, interest in team training and performance has greatly increased. The current effort discusses issues raised by Dyer in light of the past 10 years of research and remaining research needs in these critical areas.
DTIC
Education; Human Performance; Teams; Armed Forces

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ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19980037745 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Absorbing Outflows in AGN ***Final Report, 31 May 1995 - 30 Apr. 1997***
Mathur, S., Smithsonian Astrophysical Observatory, USA; Absorbing Outflows in AGN; May 1997; 19p; In English; Also announced as 19980037746 through 19980037749
Contract(s)/Grant(s): NAGw-4490
Report No.(s): NASA-CR-204477; NAS 1.26:204477; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Topics considered include: Strong X-ray absorption in broad absorption line quasar: PHL 5200: GB 1508+5714, the first greater than 4 radio-selected quasar in X rays; Broad absorption line quasars observed by the ROSAT PSPC; and Optical detection of the hidden nuclear engine in NGC 4258.
CASI
Optical Measurement; Quasars; ROSAT Mission

19980037746 NASA Goddard Space Flight Center, Greenbelt, MD USA
Strong X-Ray Absorption in a Broad Absorption Line Quasar: PHL 5200
Mathur, Smita, Harvard-Smithsonian Center for Astrophysics, USA; Elvis, Martin, Harvard-Smithsonian Center for Astrophysics, USA; Singh, K. P., NASA Goddard Space Flight Center, USA; Absorbing Outflows in AGN; May 1997, pp. L9-L12; Repr. from Astrophysical Journal, v. 455, Dec. 10, 1995 p L9-L12; In English; Also announced as 19980037745
Contract(s)/Grant(s): NAS8-39073; NAGw-2201; NAG5-2563; NAGw-4490; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche
We present ASCA observations of the z = 1.98 prototype broad absorption line quasar (BALQSO):PHL5200. The source was detected in both SIS and GIS. A power-law spectrum (alpha(sub E) = 0.6(sup +0.9)(sub -0.6) with large intrinsic absorption (N(sub H) = 1.3(sup +2.3)(sub -1.1) x 10(exp 23)/sq cm) best describes the spectrum. Excess column density over the local Galactic value is required at the 99% confidence level. This detection suggests that, although BALQSOs are X-ray-quiet, it is strong absorption in the BAL region that makes them appear faint to low-energy X-ray experiments. The required intrinsic absorbing column density is 2-3 orders of magnitude larger than earlier estimates of column densities in BALQSOs. This implies that the BAL systems are much more highly ionized than was previously thought.
Author
X Ray Absorption; Quasars; Line Spectra

19980037747 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA USA
GB 1508+5714, The First Z Greater than 4 Radio-Selected Quasar In X Rays
Mathur, Smita, Harvard-Smithsonian Center for Astrophysics, USA; Elvis, Martin, Harvard-Smithsonian Center for Astrophysics, USA; Absorbing Outflows in AGN; May 1997; ISSN 0004-6256, pp. 1551-1553; Repr. from Astronomical Journal, v. 110, no. 4, Oct. 1995 p 1551-1553; In English; Also announced as 19980037745
Contract(s)/Grant(s): NAS8-39073; NAGw-2201; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche
We report the detection in X ray of a high redshift (z=4.30) radio-loud quasar, GB 1508+5714, the first radio-selected z greater than 4 quasar seen in X rays. The quasar was observed serendipitously with the Einstein observatory lPC at 0.02 +/- 0.003 counts/s. It is ten times brighter than the other two z greater than 4 X-ray detected quasars. The X-ray source is unusually hard, implying either alpha(sub E) less than 0.2, or N(sub H) greater than 10(exp 22) atoms/sq cm (1(sigma) limits) for a simple power-law plus intrinsic (z=4.3) absorption. Intrinsic absorption would make GB 1508+5714 similar to a large fraction of z approx. 3 radio-loud quasars.
Author
Quasars; Red Shift; X Rays

19980037748 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA USA

Broad Absorption Line Quasars Observed by the ROSAT PSPC

Green, Paul J., Harvard-Smithsonian Center for Astrophysics, USA; Mathur, Smita, Harvard-Smithsonian Center for Astrophysics, USA; Absorbing Outflows in AGN; May 1997, pp. 637-642; Repr. from Astrophysical Journal, v. 462, May 10, 1996 p 637-642; In English; Also announced as 19980037745

Contract(s)/Grant(s): NAS5-26555; NAGw-4490; NSF INT-92-01412; HF-1032.01-92A; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Recent results from the ROSAT All-Sky Survey have shown that Broad Absorption Line (BAL) QSOs are either highly absorbed or underluminous in the soft X-ray bandpass. Here we extend this work by analyzing all known bona fide BAL QSOs observed within the inner 20 min of the ROSAT Position Sensitive Proportional Counter. This sample includes both targeted and serendipitous exposures ranging from 8 to 75 ks. Despite these deep exposures, most of the BAL QSOs are undetected and have unusually weak X-ray emission, as evidenced by large optical-to-X-ray slopes alpha(sub ox). Large values of alpha(sub ox)(approx. greater than 1.8) may prove to be a defining characteristic of BAL QSOs. We predict that samples of QSO candidates with large alpha(sub ox) will yield a higher percentage of BAL QSOs, particularly at low redshift. As a corollary, X-ray selected QSO samples should yield fewer BAL QSOs. The optical/UV emission line spectra of BAL and non-BAL QSOs are quite similar, suggesting that their intrinsic spectral energy distributions are similar as well. Absorption thus seems the likely reason for the X-ray-quiet nature of BAL QSOs. to constrain the total absorbing column of the BAL clouds, we compare our measured soft X-ray fluxes or upper limits with those expected from normal radio-quiet QSOs of comparable optical continuum magnitude and redshift. From sensitive X-ray observations, we derive column densities of approx. less than 2 x 10(exp 22)/sq cm for intrinsic cold absorbers of solar metallicity. These new results suggest columns at least an order of magnitude larger than the columns previously estimated from optical/UV spectra alone.

Author

Quasars; Spaceborne Experiments; Ultraviolet Spectra; Ultraviolet Radiation; Stellar Luminosity; Red Shift; Emission Spectra

19980037749 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA USA

Optical Detection of the Hidden Nuclear Engine in NGC 4258

Wilkes, Belinda J., Harvard-Smithsonian Center for Astrophysics, USA; Schmidt, Gary D., Arizona Univ., USA; Smith, Paul S., Arizona Univ., USA; Mathur, Smita, Harvard-Smithsonian Center for Astrophysics, USA; McLeod, Kim K., Harvard-Smithsonian Center for Astrophysics, USA; Absorbing Outflows in AGN; May 1997, pp. L13-L16; Repr. from Astrophysical Journal, v. 455, no. 1, Dec. 10, 1995 p L13-L16; In English; Also announced as 19980037745

Contract(s)/Grant(s): NSF AST-91-14087; NAG5-1630; NAGw-3134; NAGw-4266; NAGw-2201; NAGw-4490; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

The subparsec masing disk recently found to be orbiting a central mass of approx. 3.6 x 10(exp 7) Ms in the Seyfert/LINER galaxy NGC 4258 (Miyoshi and coworkers) provides the most compelling evidence to date for the existence of a massive black hole in the nucleus of a galaxy. The disk is oriented nearly edge-on, and the X-ray spectrum is heavily absorbed. Therefore, in this galaxy, the optical emission-line spectrum generally exhibited by an active galactic nucleus is perhaps best sought using polarized light: probing for light scattered off material surrounding the central source. New polarimetry of NGC 4258 has uncovered a compact polarized nucleus whose spectrum consists of a faint blue continuum similar to those of unobscured quasars (F(sub upsilon) proportional to upsilon(sup -1.1)), plus broadened (approx. 1000 km/s) emission lines. The lines are strongly linearly polarized (5%-10%) at a position angle (85 deg +/- 2 deg) coincident with the plane of the maser disk. This result provides substantiating evidence for a weakly active central engine in NGC 4258 and for the existence of obscuring, orbiting tori, which impart many of the perceived distinctions between various types of active galaxies.

Author

Optical Measurement; Nuclear Radiation; Active Galactic Nuclei; Toruses

19980037750 Nishi-Harima Astronomical Observatory, Japan

Nishiharima Astronomical Observatory, No. 6 ***Annual Report***

1996; ISSN 0917-6926; 47p; In Japanese; Also announced as 19980037751 through 19980037752; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Topics Considered Include: (1) BVR CCD Photometric Observation and the Analysis of the Open Cluster NGC7790.(2) Cooperative Photometric Observations of the Primary Minimum of the Active Algol-type Binary RZ Cas.

CASI

Observation; Photometry; Open Clusters

19980037751 Kyushu Univ., Faculty of Science, Fukuoka, Japan

BVR CCD Photometric Observation and the Analysis of the Open Cluster NGC7790

Tanabe, Kazutaka, Kyushu Univ., Japan; Shindo, Masako, Kyushu Univ., Japan; Ono, Tomoko, Nishi-Harima Astronomical Observatory, Japan; Narusawa, Shinya, Nishi-Harima Astronomical Observatory, Japan; Yamaoka, Hitoshi, Kyushu Univ., Japan; Nishiharima Astronomical Observatory; 1996, No. 6, pp. 1-11; In Japanese; Also announced as 19980037750; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We performed the photometric observation of the open cluster NGC7790 with a CCD camera at Nishi-Harima Astronomical Observatory. The Color equations which convert the instrumental magnitudes using Nishi-Harima system to the standard magnitudes by Johnson-Cousin system are presented. The color-magnitude diagrams are shown and the distance and the age of the cluster are derived from it.

Author

Photometry; Observation; Color-Magnitude Diagram; Open Clusters

19980037752 Nishi-Harima Astronomical Observatory, Japan

Cooperative Photometric Observations of the Primary Minimum of the Active Algol-type Binary RZ Cas

Narusawa, Shin-ya, Nishi-Harima Astronomical Observatory, Japan; Nishiharima Astronomical Observatory; 1996, No. 6, pp. 12-14; In Japanese; Also announced as 19980037750; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Cooperative monitoring photometry for the primary minimum of the active Algol-type binary RZ Cas has been carried out in order to clarify unusual feature of the light variation. Observations with the ordinary photoelectric equipment and CCD camera are used to clarify whether the primary minimum is 'pseudo-partial eclipse' or not. We detected no clear flat bottom the period from September to December 1995.

Author

Observation; Binary Stars; Astronomical Photometry

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19980037035 Texas Univ., Austin, TX USA

High Resolution Mid-Infrared Spectroscopy of Celestial Sources ***Final Report, 1 Apr. 1994 - 31 Jan. 1997***

Lacy, John H., Texas Univ., USA; May 01, 1997; 117p; In English

Contract(s)/Grant(s): F19628-93-K-0011; AF Proj. 3054

Report No.(s): AD-A335688; PL-TR-97-2076; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This contract supported high resolution telescopic observations of a wide variety of celestial sources at wavelengths between 5 and 25 microns. The observations were made to provide information about targets to be observed by the Infrared Space Observatory Short Wavelength Spectrometer and to provide data relevant to the Air Force Celestial Background Scene Descriptor. Observations made at the European Southern Observatory and the NASA Infrared Telescope Facility are described.

DTIC

European Southern Observatory; High Resolution; Infrared Space Observatory (ISO); Infrared Telescopes

19980037664 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Galileo Plasma Wave Observations Near Europa

Gurnett, D. A., Iowa Univ., USA; Kurth, W. S., Iowa Univ., USA; Roux, A., Centre des Etudes Terrestraire et Planetaire, France; Bolton, S. J., Jet Propulsion Lab., California Inst. of Tech., USA; Thomsen, E. A., Iowa Univ., USA; Groene, J. B., Iowa Univ., USA; Geophysical Research Letters; Feb. 01, 1998; ISSN 0094-8534; Volume 25, No. 3, pp. 237-240; In English; Original contains color illustrations

Contract(s)/Grant(s): JPL-958799

Report No.(s): NASA/CR-1998-207700; NAS 1.26:207700; Paper-97GL03706; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

In this paper we present results from the Galileo plasma wave instrument during the first two flybys of Europa, which occurred on December 19, 1996, and February 20, 1997. Strong whistler-mode noise was observed in the vicinity of Europa during both flybys. Emission at the upper hybrid resonance frequency, f(sub UH), and a propagation cutoff at the local electron plasma frequency, f(sub pe), provided measurements of the local electron number density. The electron density measurements show a region of highly disturbed plasma in the vicinity of Europa with density enhancements ranging from about 30 to 100 cm(exp -3) above the ambient Jovian magnetospheric background, which in both cases was about 80 cm(exp -3).
Author
Galileo Spacecraft; Plasma Waves; Europa; Resonant Frequencies; Space Plasmas; Plasma Density; Plasma Drift; Wave-Particle Interactions

19980037932 Arkansas Univ., Dept. of Chemistry and Biochemistry, Fayetteville, AR USA
The Thermal and Radiation Exposure History of Lunar Meteorites
Benoit, Paul H., Arkansas Univ., USA; Sears, Derek W. G., Arkansas Univ., USA; Symes, Steven J. K., Arkansas Univ., USA; Meteoritics and Planetary Science; 1996; Volume 31, pp. 869-875; In English
Contract(s)/Grant(s): NAGw-3519; NAGw-981; NSF DPP-91-5521
Report No.(s): NASA/CR-96-207732; NAS 1.26:207732; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

We have measured the natural and induced thermoluminescence (TL) of seven lunar meteorites in order to examine their crystallization, irradiation, and recent thermal histories. Lunar meteorites have induced TL properties similar to Apollo samples of the same provenance (highland or mare), indicating similar crystallization and metamorphic histories. MacAlplne Hills 88104/5 has experienced the greatest degree of impact/regolith processing among the highland-dominated meteorites. The basaltic breccia QUE 94281 is dominated by mare component but may also contain a significant highland component. For the mare-dominated meteorites, EET 87521 may have a significant highland impact-melt component, while Asuka 881757 and Y-793169 have been heavily shocked. The thermal history of Y-793169 included slow cooling, either during impact processing or during its initial crystallization. Our natural TL data indicate that most lunar meteorites have apparently been irradiated in space a few thousand years, with most less than 15,000 a. Elephant Moraine 87521 has the lowest irradiation exposure time, being less than 1,000 a. Either the natural TL of ALHA81005, Asuka 881757 and Y-82192 was only partially reset by lunar ejection or these meteorites were in small perihelia orbits (less than or equal to 0.7 AU).
Author
Meteorites; Lunar Surface; Thermoluminescence

19980038070 Morehead State Univ., Dept. of Physical Sciences, KY USA
NGC 5291: Implications for the Formation of Dwarf Galaxies
Malphrus, Benjamin K., Morehead State Univ., USA; Simpson, Caroline E., Florida International Univ., USA; Gottesman, S. T., Florida Univ., USA; Hawarden, Timothy G., Joint Astronomy Centre, USA; The Astronomical Journal; Oct. 1997; ISSN 0004-6256; Volume 114, No. 4, pp. 1427-1446; In English
Contract(s)/Grant(s): NAGw-2166
Report No.(s): NASA/CR-97-207124; NAS 1.26:207124; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The possible formation and evolution of dwarf irregular galaxies from material derived from perturbed evolved galaxies is addressed via an H I study of a likely example, the peculiar system NGC 5291. This system, located in the western outskirts of the cluster Abell 3574, contains the lenticular galaxy NGC 5291 which is in close proximity to a disturbed companion and is flanked by an extensive complex of numerous knots extending roughly 4 min north and 4 min south of the galaxy. In an initial optical and radio study, Longmore et al. (1979, MNRAS, 188, 285) showed that these knots have the spectra of vigorous star-forming regions, and suggested that some may in fact be young dwarf irregular galaxies. High resolution 21-cm line observations taken with the VLA are presented here and reveal that the H I distribution associated with this system encompasses not only the entire N-S complex of optical knots, but also forms an incomplete ring or tail that extends approximately 3 min to the west. The H I associated with NGC 5291 itself shows a high velocity range; the Seashell is not detected. The formation mechanism for this unusual system is unclear and two models - a large, low-luminosity ram-swept disk, and a ram-swept interaction-are discussed. The H I in the system contains numerous concentrations, mostly along the N-S arc of the star-forming complexes, which generally

coincide with one or more optical knots; the larger H I features contain several x 10(exp 9) solar mass of gas. Each of the knots is compared to a set of criteria designed to determine if these objects are bound against their own internal kinetic energy and are tidally stable relative to the host galaxy. An analysis of the properties of the H I concentrations surrounding the optical star-forming complexes indicates that at least the largest of these is a bound system; it also possesses a stellar component. It is suggested that this object is a genuinely young dwarf irregular galaxy that has evolved from the material associated with the system and that this entire complex contains several proto- or young dwarf irregular galaxies in various stages of development. We are therefore witnessing the early evolution of a number of genuinely young galaxies. Given the evident importance of the NGC 5291 system as a 'nursery' for young galaxies, careful modeling is required if we are to understand this remarkable galaxy.
Author
Dwarf Galaxies; Galactic Evolution; Irregular Galaxies; High Resolution

19980038124 NASA Ames Research Center, Moffett Field, CA USA
Sulfur and Hydrogen Isotope Anomalies in Meteorite Sulfonic Acids
Cooper, George W., NASA Ames Research Center, USA; Thiemens, Mark H., California Univ., San Diego, USA; Jackson, Teresa L., California Univ., San Diego, USA; Chang, Sherwood, NASA Ames Research Center, USA; Science; Aug. 22, 1997; Vol. 277, pp. 1072-1074; In English
Contract(s)/Grant(s): NCC2-906
Report No.(s): NASA/CR-97-207330; NAS 1.26:207330; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Intramolecular carbon, hydrogen, and sulfur isotope ratios were measured on a homologous series of organic sulfonic acids discovered in the Murchison meteorite. Mass-independent sulfur isotope fractionations were observed along with high deuterium/hydrogen ratios. The deuterium enrichments indicate formation of the hydrocarbon portion of these compounds in a low-temperature environment that is consistent with that of interstellar clouds. Sulfur-33 enrichments observed in methanesulfonic acid could have resulted from gas-phase ultraviolet irradiation of a precursor, carbon disulfide. The source of the sulfonic acid precursors may have been the reactive interstellar molecule carbon monosulfide.
Author
Sulfur Isotopes; Hydrogen Isotopes; Anomalies; Sulfonic Acid; Carbon Compounds; Vapor Phases; Molecular Clouds; Hydrogen; Isotope Ratios

19980038219 Arkansas Univ., Cosmochemistry Group, Fayetteville, AR USA
The Orbits of Meteorites from Natural Thermoluminescence, Attachment 5
Benoit, P. H., Arkansas Univ., USA; Sears, D. W. G., Arkansas Univ., USA; ICARUS; 1997; ISSN 0019-1035; Volume 125, pp. 281-287; In English
Contract(s)/Grant(s): NAGw-3479
Report No.(s): NASA/CR-97-207733; NAS 1.26:207733; Rept-IS965622; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The natural thermoluminescence (TL) of meteorites reflects their irradiation and thermal histories. Virtually all ordinary chondrites have been irradiated long enough to reach saturation natural TL levels, and thus natural TL levels in these meteorites are determined largely by thermal history. The primary heat source for most meteorites is the Sun, and thus natural TL levels are determined primarily by the closest approach to the Sun, i.e., perihelion. By converting natural TL levels to perihelia, using an assumed albedo typical of meteoroid bodies, it is found that most ordinary chondrites had perihelia of 0.85 to 1.0 AU prior to reaching Earth. This range is similar to that calculated from meteor and fireball observations. All common classes of ordinary chondrites exhibit similar perihelia distributions; however, H and LL chondrites that fell in the local morning differ in their natural TL distribution from those that fell in the local afternoon or evening. This is consistent with earlier suggestions that time of fall reflects orbital distribution. The data also suggest that the orbits of some of the H chondrites cluster and may have come from a debris 'stream' of meteoroids. If meteorites can exist in "orbital groups," significant changes in the types and number of meteorites reaching Earth could occur on the less than 10(exp 5)-year time scale.
Author
Thermoluminescence; Chondrites; Perihelions

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LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

19980037039 NASA Johnson Space Center, Houston, TX USA
Human Exploration of Mars: The Reference Mission of the NASA Mars Exploration Study Team
Hoffman, Stephen J., Editor, Science Applications International Corp., USA; Kaplan, David I., Editor, NASA Johnson Space Center, USA; Jul. 1997; 236p; In English
Report No.(s): NASA-SP-6107; NAS 1.21:6107; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Personnel representing several NASA field centers have formulated a "Reference Mission" addressing human exploration of Mars. This report summarizes their work and describes a plan for the first human missions to Mars, using approaches that are technically feasible, have reasonable risks, and have relatively low costs. The architecture for the Mars Reference Mission builds on previous work of the Synthesis Group (1991) and Zubrin's (1991) concepts for the use of propellants derived from the Martian Atmosphere. In defining the Reference Mission, choices have been made. In this report, the rationale for each choice is documented; however, unanticipated technology advances or political decisions might change the choices in the future.
Derived from text
Mars Exploration; Manned Mars Missions; NASA Space Programs; Mission Planning

19980037413 Scripps Institution of Oceanography, La Jolla, CA USA
Extraterrestrial Life: Life on Mars - Then and Now
Arrhenius, Gustaf, Scripps Institution of Oceanography, USA; Mojzsis, Stephen, Scripps Institution of Oceanography, USA; Current Biology; 1996; ISSN 0960-1216; Volume 6, No. 10, pp. 1213-1216; In English
Contract(s)/Grant(s): NAGw-2881
Report No.(s): NASA/CR-96-207593; NAS 1.26:207593; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The recent claim to have identified possible signs of ancient life on Mars has been widely publicized and discussed. The authors conceded that none of the half-dozen pieces of evidence adduced in their paper individually provided strong support for extraterrestrial life, though they argued that the pieces added up to a case worth considering. Most - perhaps all - of the observed phenomena have counterparts in the inorganic world, so even the combination does not make a compelling case that there was ever life on Mars. Nevertheless, the importance of the problem has justified bringing the results to general attention. The paper has focussed interest on the origin and possible ubiquity of life, and on how we can design techniques capable of giving a more definitive answer to the question of whether there is, or has ever been, life elsewhere in the Universe.
Author
Extraterrestrial Life; Mars (Planet)

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

19980038203 Naval Research Lab., Solarvariability Section, Washington, DC USA
Yohkoh Bragg Crystal Spectrometer Light Curves for S XV (5.0163 - 5.1143 A), *1 Oct. 1995 - 30 Sep. 1996*
Mariska, John T., Naval Research Lab., USA; Bentley, R. D., University Coll., UK; Pike, C. D., Rutherford Appleton Lab., UK; Dec. 30, 1996; 372p; In English
Report No.(s): AD-A336978; NRL/PU/7673-96-7906; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This memorandum report summarizes the data produced during the fifth year of operation by the Bragg Crystal Spectrometer (BCS) on the Yohkoh spacecraft. Each page shows the total count rate in the S XV channel of the BCS for a single day. This channel nominally observes the Sun in the wavelength range from 5.0163 - 5.1143 A. These plots are useful for identifying flare data for further analysis and for determining the data file name and tape number that contains the data.
DTIC
Solar Flares; Light Curve

19980038247 Naval Research Lab., Solarvariability Section, Washington, DC USA

Yohkoh Bragg Crystal Spectrometer Light Curves for S XV (5.0163 - 5.1143 Angstroms), *1 Oct. 1996 - 30 Sep. 1997*

Mariska, John T., Naval Research Lab., USA; Bentley, R. D., University Coll., UK; Pike, C. D., Rutherford Appleton Lab., UK; Dec. 31, 1997; 371p; In English

Report No.(s): AD-A336976; NRL/MR/7673-97-8127; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This memorandum report summarizes the data produced during the sixth year of operation by the Bragg Crystal Spectrometer (BCS) on the Yohkoh spacecraft. Each page shows the total count rate in the S XV channel of the BCS for a single day. This channel nominally observes the Sun in the wavelength range from 5.0163 - 5.1143 Angstroms. These plots are useful for identifying flare data for further analysis and for determining the data file name and tape number that contains the data.

DTIC

Solar Flares; Light Curve

Subject Term Index

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